



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

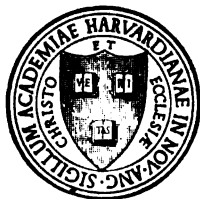
We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

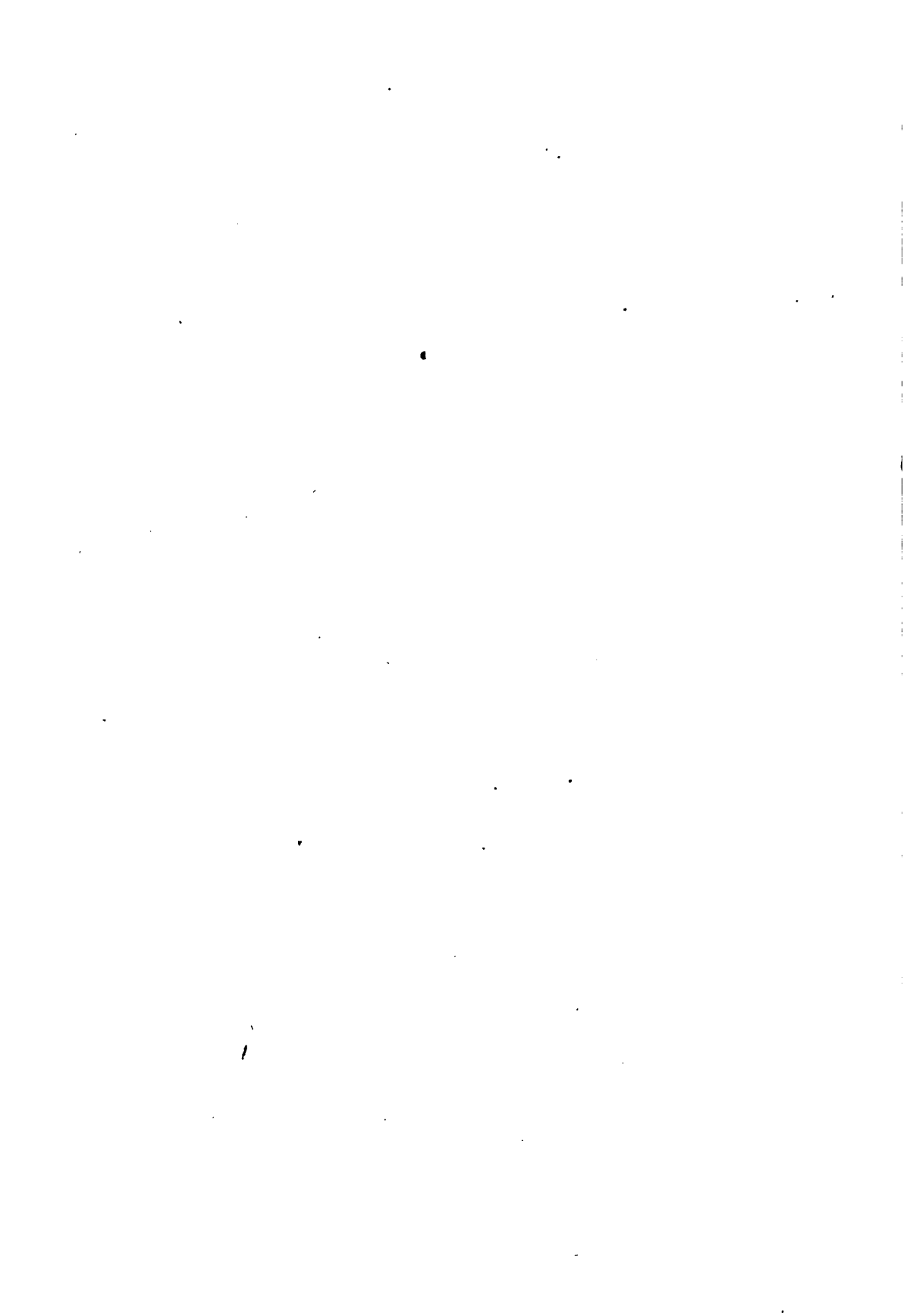
Med 1760.61



Harvard College Library

PROST

Transferred from
Social Ethics Library



Rec- 1760.61

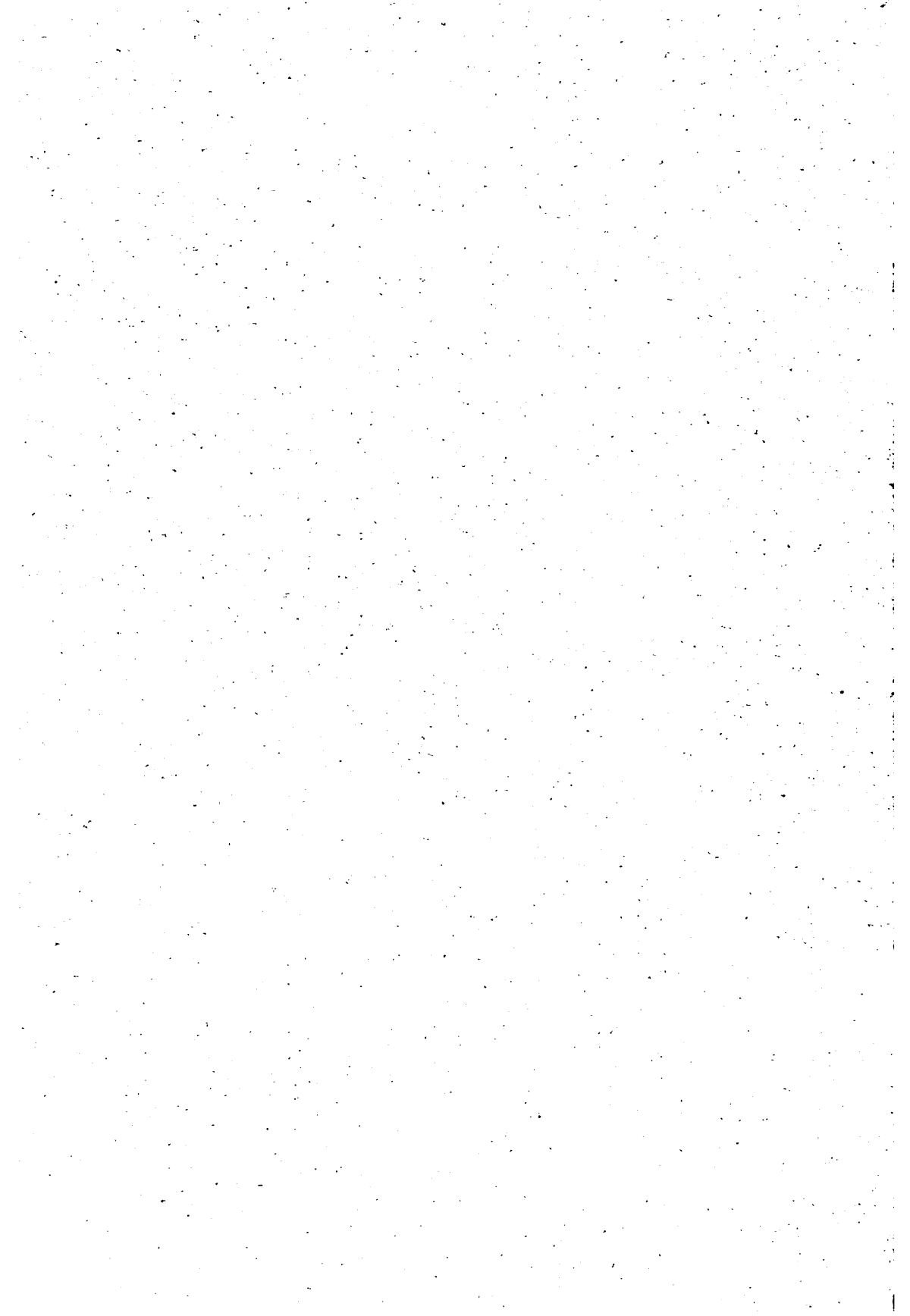
SECOND ANNUAL REPORT

OF THE

HENRY PHIPPS INSTITUTE

FOR THE STUDY, TREATMENT, AND
PREVENTION OF TUBERCULOSIS

February 1, 1904, to February 1, 1905



0

SECOND ANNUAL REPORT

OF THE

HENRY PHIPPS INSTITUTE

=

FOR THE STUDY, TREATMENT, AND
PREVENTION OF TUBERCULOSIS

AN ACCOUNT OF THE WORK OF THE SECOND YEAR, A REVIEW OF THE SUBJECT
OF IMMUNIZATION IN TUBERCULOSIS, A PRELIMINARY REPORT ON THE
MARAGLIANO SERUM TREATMENT, AND A REPORT OF SOME OF
THE SCIENTIFIC WORK DONE BY MEMBERS OF THE
STAFF OF THE INSTITUTE DURING THE YEAR

PUBLISHED BY THE
HENRY PHIPPS INSTITUTE
238 PINE STREET, PHILADELPHIA
1906

SEP 24 1915

Transferred to
Widener Library

MEDICAL STAFF OF THE INSTITUTE DURING
THE SECOND YEAR.

Medical Director,
LAWRENCE F. FLICK, M.D.

Assistant Medical Director and Bacteriologist,
MAZYCK P. RAVENEL, M.D.

Physicians,

JOSEPH WALSH, M.D.
CHAS. J. HATFIELD, M.D.
J. W. IRWIN, M.D.
GEORGE W. NORRIS, M.D.
WARD BRINTON, M.D.
FRANK A. CRAIG, M.D.
H. R. M. LANDIS, M.D.
WM. B. STANTON, M.D.
HORACE CARNCROSS, M.D.
JOSEPHUS T. ULLOM, M.D.

W. B. FETTERMAN, M.D.
W. TAYLOR CUMMINS, M.D.
CHARLES BROWNE, M.D.
JOHN M. CRUICE, M.D.
ALBERT P. FRANCINE, M.D.
SAMUEL RHOADS, M.D.
IRWIN E. BENNETT, M.D.
HORATIO C. WOOD, M.D.
CHARLES M. MONTGOMERY, M.D.
VERNER NESBIT, M.D.

Laryngologists,
GEO. B. WOOD, M.D.
W. G. B. HARLAND, M.D.

Dermatologist,
J. FRANK WALLIS, M.D.

Neurologist,
D. J. McCARTHY, M.D.

Pathologists,
RANDLE C. ROSENBERGER, M.D.
C. Y. WHITE, M.D.

Ophthalmologist,
EDWARD H. SHUMWAY, M.D.

Veterinary Surgeon,
LEONARD PEARSON.

Genito-urinary Surgeon,
HENRY TUCKER, M.D.

Honorary Fellows,
EDWARD L. TRUDEAU, M.D. EDOARDO MARAGLIANO, M.D.
L. SIMS WOODHEAD, M.A. (Cantab.), M.D. (Edin.).

NOV 17 1916

THE WORK OF THE YEAR.

The second year's work of the Henry Phipps Institute, like the first, has been carried on in temporary quarters and under difficulties. There has been better order, however, and more perfect organization, and the work has therefore been more exact. The impediments and difficulties encountered increase the value of the work from a sociological point of view, inasmuch as they have enabled the Institute to give an object-lesson of what can be done under unfavorable conditions.

Long before the end of the first year the Institute had reached the full capacity of its quarters and had used every available foot of floor space for some useful purpose. The building had gradually shaped itself along lines of utility until every part of it had been used for that purpose to which it was best adapted and for which it could be used with least friction and inconvenience. The nurses had already been crowded out of the building and the space which had been set aside for laboratory work and for a pathological museum was rapidly growing inadequate.

Early in the second year the Institute rented a house a short distance from the Institute for the nurses' home, in order that it might keep all its nurses under one roof and be able to establish a training school. The nurses have been maintained in this building since then, and their maintenance has been made part of the maintenance of the hospital. The training school has been opened and successfully conducted. The didactic teaching is done in the nurses' home.

A building has also been rented on the outside near the Institute for a laboratory and an extension of the pathological museum.

This building has been fitted up for laboratory purposes and for the dispensation of milk to dispensary cases. The first floor of the building is used as a milk dispensary and the cellar and other three floors for laboratory purposes. Although an old building, and badly built at that, it has answered its purpose.

In addition to the milk dispensary which has been opened in the laboratory building a milk station has been equipped in the Kensington District in what is known as the Boys' Club Room. The use of this club room has been given to the Institute free by Mrs. Robert R. P. Bradford. Milk is served from both stations every morning by nurses of the Institute. In West Philadelphia milk is still served through a milk dealer.

As now equipped, the Institute does work in three separate buildings. This increases the cost of maintenance considerably; it also makes discipline more difficult. In spite of everything, however, good work has been done at a relatively low cost.

The amount of work done in the dispensary during the second year has been somewhat less than during the first year. This has been due not to a lack of material, but to greater exactitude. More time has been given to each patient and better scientific work has been done. The staff actually has been increased during the year, so that the number of workers has been larger. It is safe to say that the work has improved in quality just as it has decreased in quantity. The clerical force has been increased and better organized. The records, therefore, have been better kept and the business side of the Institute has been more carefully looked after.

In the hospital department of the Institute the amount of work has been greater than during the first year. All of the beds have been kept full at all times.

Fifteen hundred and sixty-two cards were issued for treatment during the year. Two of these cards were given to one and the same patient. There were therefore fifteen hundred and sixty-one patients admitted. Of these, thirteen hundred and eighty-two

were admitted into the dispensary and two hundred and ninety-four into the hospital. Of the total number admitted one hundred and fifteen were admitted both into the dispensary and into the hospital. Four hundred and forty of the patients admitted had been treated in the dispensary during the previous year, sixty-two had been treated in the hospital, and eight had been treated in both.

Nine hundred and forty-two of the cases admitted into the dispensary and one hundred and ninety-eight of those admitted into the hospital were new cases. Seventy-three of these were treated in both the hospital and in the dispensary. There were, therefore, one thousand and sixty-seven new cases admitted for treatment during the year. One hundred and seventy-nine of the dispensary cases and three of the hospital cases were either non-tuberculous or unsuitable, leaving seven hundred and sixty-three proper cases of tuberculosis in the dispensary and one hundred and ninety-five in the hospital for the year. Adding these together and subtracting from them seventy-three cases which were treated in both hospital and dispensary, we have eight hundred and eighty-five new cases to report on. A more elaborate report will be made on these than was made on the cases of the previous year. On matters previously reported on a summary for the two years will be given.

Of the old cases admitted for treatment during the year, seventeen were non-tuberculous or unsuitable, and four hundred and seventy-seven were poor people suffering from tuberculosis. The entire number of poor persons treated for tuberculosis during the year, therefore, was thirteen hundred and sixty-two. Except in the matter of nativity, we will report only on the poor tuberculous cases.

The poor tuberculous cases which were treated during the first year will be further reported on in those matters for which statistics were not given during the first year and are given during the second year. A further report also will be made on

them in results obtained and they will be separately studied in relation to their treatment during the first year.

In the report for the first year, in many of the tables, non-tuberculous and unsuitable cases were included. This will not be done this year, and in the summaries for two years non-tuberculous and unsuitable cases which were included in the first year's tables will be omitted.

The order of subjects will be somewhat changed in this report from that used in the first report. This becomes necessary on account of the introduction of many new topics. Most of the new topics are sociological, but some are medical. All the data are gathered and presented for the purpose of giving a broad practical view of the tuberculosis problem.

NATIVITY.

New cases, ..	{	Native born,.....	522	}	885	{	Admitted for treatment during the year, 1961.
		Foreign born (males),.....	199				
		Foreign born (females),.....	162				
		No record,.....	2				
		Non-tuberculous and unsuitable,.....	182				
Old cases, ..	{	Tuberculous,.....	477	}	494	{	
		Non-tuberculous and unsuitable,.....	17				
Summary for two years, ..	{	Native born,.....	1378	}	2344	{	Admitted for treatment during the two years, 3107.
		Foreign born (males),.....	556				
		Foreign born (females),.....	378				
		No record,.....	32				
		Non-tuberculous, unsuitable, and undiagnosed,.....	763				
	{	Duplicates,*.....	8	}		{	
		Number added by correction,..	1				
		Highest number registered,.....	3116				

	FOR THIS YEAR. TUBERCULOUS.		FOR TWO YEARS. TUBERCULOUS.	
	<i>Personal Nativity.</i>	<i>Ancestral Nativity.</i>	<i>Personal Nativity.</i>	<i>Ancestral Nativity.</i>
America,.....	522	274	1378	748
Africa,.....	0	0	0	8
Austria,.....	20	23	54	59
Hungary,.....	4	5	14	14
Belgium,.....	0	0	1	1

* Since the first report was issued it has been discovered that a case which had been put down as a duplicate was really the brother of the other case. The number of duplicates for the first year therefore was seven instead of eight.—L. F. F

NATIVITY.—(Continued.)

	FOR THIS YEAR.		FOR TWO YEARS.	
	TUBERCULOUS.		TUBERCULOUS.	
	Personal Nativity.	Ancestral Nativity.	Personal Nativity.	Ancestral Nativity.
Bohemia,.....	0	0	0	1
British Columbia,.....	0	0	1	0
British Guiana,.....	1	0	2	1
Canada,.....	2	1	6	2
Cuba,.....	1	2	2	3
Denmark,.....	1	2	1	2
England,.....	36	46	81	100
France,.....	0	0	6	8
Germany,.....	57	89	120	220
Ireland,.....	82	208	234	600
Italy,.....	13	18	60	68
Jamaica,.....	0	0	1	0
Newfoundland,.....	3	3	5	5
Norway,.....	2	2	5	5
Nova Scotia,.....	1	1	1	2
Poland,.....	4	5	8	11
Portugal,.....	0	0	1	1
Roumania,.....	13	13	26	26
Russia,.....	103	113	256	273
Scotland,.....	7	7	21	25
Spain,.....	0	0	1	1
Sweden,.....	6	7	10	11
Switzerland,.....	0	0	5	5
Syria,.....	0	1	3	4
Turkey,.....	1	1	1	1
Wales,.....	2	1	4	3
West Indies,.....	0	1	2	4
East Indies,.....	1	0	1	0
China,.....	1	1	1	1
Nativity unknown,.....	2	4	32	35

MIXED PARENTAGE.

	FOR THIS YEAR.	FOR TWO YEARS.
	TUBERCULOUS.	TUBERCULOUS.
America-Canada,.....	1	1
America-England,.....	8	11
America-Germany,.....	4	8
America-Ireland,.....	23	34
America-Holland,.....	1	1
America-France,.....	0	1
America-Norway,.....	1	1
America-Roumania,.....	1	1
America-Scotland,.....	1	1
America-Wales,.....	0	1
Denmark-Norway,.....	1	1
Cuba-America,.....	0	1
England-Ireland,.....	8	14
England-Scotland,.....	1	2
England-Wales,.....	0	1
England-Newfoundland,.....	0	1
Germany-Ireland,.....	1	2

MIXED PARENTAGE.—(Continued.)

	FOR THIS YEAR. TUBERCULOUS.	FOR TWO YEARS. TUBERCULOUS.
Germany-France,.....	1	1
Ireland-Switzerland,.....	1	1
Scotland-Ireland,.....	3	9
Scotland-Wales,.....	0	1
Spain-France,.....	0	1
Sweden-Mexico,.....	1	1

As in the previous year so this year nearly one-half of the patients treated were foreign born. Many had been in the country a comparatively short time before coming under treatment. These probably had tuberculosis when they landed on our shores, and represent a burden upon our country which we ought not to be asked to carry. A ruling has been made by the United States Government to exclude consumptive immigrants, but evidently this ruling is not well enforced. The foreign-born females nearly equal the foreign-born males for this year, the statistics differing in this regard from the statistics of the previous year. Absolute exclusion of tuberculous immigrants would lessen the burden of our crusade against tuberculosis at least one-third.

RESIDENCE.

New cases,.....	{ Philadelphia,.....	811	} 885
	{ Pennsylvania,.....	44	
	{ Other States,.....	29	
	{ No record,.....	1	
Summary for two years,.....	{ Philadelphia,.....	2177	} 2344
	{ Pennsylvania,.....	105	
	{ Other States,.....	59	
	{ No record,.....	3	

A slightly larger percentage of the cases came from outside of Philadelphia this year than last. This probably is due to the spread of knowledge of the Institute's existence. The vast majority of cases will always come from Philadelphia, inasmuch as it will not be possible to give material aid to non-residents. Those who came from outside of Philadelphia usually either came to the dispensary for an expert opinion or came into the hospital to die.

CHARACTER OF THE STREETS ON WHICH THE PATIENTS LIVED.

Number of patients who lived on	Through streets,.....	802	} 885 new cases.
	In open spaces,.....	9	
	Blind alleys,.....	40	
	No record,.....	34	
	Through streets,.....	322	} 477 old cases.
	In open spaces,.....	0	
	Blind alleys,.....	4	
	No record,.....	151	

In recent years considerable stress has been laid by some writers on the character of the streets upon which people live as an etiological factor in tuberculosis. In Philadelphia vastly the majority of the people live on through streets and yet in the slum districts quite a large number live in what are known as blind alleys—that is, streets with but one outlet. It is somewhat surprising, therefore, to find so few cases returned from blind alleys. As far as the figures here given indicate anything they do not bear out the claim that the character of the street is a determining factor in the implantation or development of tuberculosis.

HOUSING.

Number of patients.....	Who lived in apartment houses,	97	} 885 new cases.
	Who lived privately,	190	
	No record,.....	598	
	Who lived in apartment houses,	78	} 477 old cases.
	Who lived privately,.....	151	
	Who lived in orphan asylum,.....	1	
	No record,.....	247	

The housing of the poor is an important social problem which grows in importance as cities grow larger. Living in houses at all is artificial and has grown out of the exigencies of life springing from climate and human depravity. We need houses for comfort, privacy, and protection. Houselife, however, brings disease, and herein lies the penalty for our civilization. With the growth of knowledge and the advancement of art we see how the benefits of the house can be retained and the evils which attend it done away with. This then is a great problem and one

which will have to be worked out for the poor and the ignorant by the wealthy and the educated. Of all diseases, tuberculosis more than any other is a house disease. It is implanted in the house, develops in the house, and it matures in the house. Without the house in the broad sense of the word there probably could be no tuberculosis, as a cause of death, at least.

As between apartment houses and private houses as predisposing causes of tuberculosis there is something to be said on both sides. Apartment houses as they have been built in the past undoubtedly are more conducive to tuberculosis than are private houses; as they may be built and ought to be built they are less conducive. Cleanliness, ventilation, drainage, comfort, and convenience are the factors in the house which count most for health and freedom from disease, and where these can be had in greatest proportion is the most healthful place to live. With the poor it is chiefly an economical question, and there is no doubt that a greater amount of comfort, convenience, and sanitation is procurable with the money at the command of the laboring man in an apartment house than in a private house, provided apartment houses are built with these objects in view and not for the mere purpose of making money for the landlord.

CHANGE OF RESIDENCE.

Number of patients, ..	New cases, 885	Who changed place of residence,.....	502	Aggregate number of changes, 1071. Average number of changes, 2.13.
		Who did not change place of residence,.....	171	
		Of whom no record was made as to change of residence,	212	
	Old cases, 477	Who changed place of residence,.....	92	Aggregate number of changes, 154. Average number of changes, 1.6.
		Who did not change place of residence,.....	242	
		Of whom no record was made as to change of residence,	143	

The poor consumptive changes his place of residence very often. He is constantly on the move. This is due to two causes: one because he is an undesirable tenant and the other because he cannot pay rent. A coughing, wretched-looking individual, tottering on the brink of the grave, is objectionable to neighbors and fellow tenants, and landlords soon discover it and get rid of him. Inability to pay, however, is even more frequently the cause of removal. With an uncertain income and a constant drain on the scanty resources rent-day frequently comes with the treasure box empty. Removal is the only remedy. The worst feature of this whole matter is that these poor people circulate in the worst and most unsanitary houses and infect each house into which they move. Only the houses which do not rent well are open to them and their kind. To occupy one of those houses is almost sure death. What a blot upon civilization that such places should exist and that in most cities nothing is done to disinfect them!

AGE.

New cases,	{	Under 10 years,	19	}	885
		10 to 20 years,.....	137		
		20 to 30 years,.....	285		
		30 to 40 years,	242		
		40 to 50 years,.....	124		
		Over 50 years,.....	72		
		No record,.....	6		
Summary for two years,.....	{	Under 10 years,	42	}	2344
		10 to 20 years,.....	265		
		20 to 30 years,.....	739		
		30 to 40 years,.....	705		
		40 to 50 years,.....	387		
		Over 50 years,.....	198		
		No record,.....	8		

The age at which the tuberculous subject breaks down remains practically the same for the second year as it was for the first. For the two years the largest number of patients who came for treatment were between the ages of twenty and forty and the number between twenty and thirty and between thirty and forty was about the same. Recent careful clinical observations and laboratory studies seem to show that tuberculosis frequently

is implanted early in life. The breakdown comes later in life and varies with different individuals. It registers the hardships which have been encountered at different times in different lives. That it most frequently comes between twenty and forty is largely due to prevailing social conditions. Overwork, want, sorrow, and dissipation are strong fertilizers for consumption and are most likely to come into life during this age-period. This is the productive and reproductive age-period, and is the most valuable of man's life. A disease which claims most of its victims at this time is a quarry well worth man's best huntsmanship.

SEX.

New cases,.....	{ Male,..... 485 Female,..... 400 }	885
Summary for two years,.....	{ Male,..... 1367 Female,..... 977 }	2344

The males again preponderate as they did last year. In all institutions for the tuberculous apparently more males apply for treatment than females. This preponderance probably represents the true relative frequency of tuberculosis in the two sexes. Formerly it was believed that tuberculosis occurred more frequently in females than in males, but it is now generally conceded that the reverse is true. This latter contention is borne out by the mortality statistics as well as the morbidity statistics. The male sex endures greater hardships and is more given to dissipation than the female and herein perhaps lies the explanation of the greater prevalence of active and fatal tuberculosis in the male.

At one time when it was held that tuberculosis was more prevalent in the female than in the male the wearing of corsets was given as an explanation of the preponderance, and at another time life within doors was given as an explanation. In the light of our present knowledge of tuberculosis, it would look indeed

as though dissipation and overwork were more potent factors in the development of consumption than distortion of the body and close confinement.

SOCIAL CONDITION.

New cases,	<table> <tr> <td>Single,.....</td><td>386</td><td></td></tr> <tr> <td>Married,.....</td><td>422</td><td></td></tr> <tr> <td>Widowed,.....</td><td>76</td><td></td></tr> <tr> <td>No record,.....</td><td>1</td><td></td></tr> </table>	Single,.....	386		Married,.....	422		Widowed,.....	76		No record,.....	1		885
Single,.....	386													
Married,.....	422													
Widowed,.....	76													
No record,.....	1													
Summary for two years,.....	<table> <tr> <td>Single,.....</td><td>947</td><td></td></tr> <tr> <td>Married,.....</td><td>1162</td><td></td></tr> <tr> <td>Widowed,.....</td><td>233</td><td></td></tr> <tr> <td>No record,.....</td><td>2</td><td></td></tr> </table>	Single,.....	947		Married,.....	1162		Widowed,.....	233		No record,.....	2		2344
Single,.....	947													
Married,.....	1162													
Widowed,.....	233													
No record,.....	2													

The relative proportion of the patients for this year as to social condition is about the same as it was during the first year. The majority of the patients either are married or have been married and have become widowed. This is as one would expect. The burdens and responsibilities which go with married life and the rearing of families make fertile soil for the development of consumption.

COLOR.

New cases,.....	<table> <tr> <td>White,.....</td><td>834</td><td></td></tr> <tr> <td>Black,.....</td><td>50</td><td></td></tr> <tr> <td>Yellow,.....</td><td>1</td><td></td></tr> </table>	White,.....	834		Black,.....	50		Yellow,.....	1		885			
White,.....	834													
Black,.....	50													
Yellow,.....	1													
Summary for two years,.....	<table> <tr> <td>White,.....</td><td>2191</td><td></td></tr> <tr> <td>Black,.....</td><td>151</td><td></td></tr> <tr> <td>Yellow,.....</td><td>1</td><td></td></tr> <tr> <td>No record,.....</td><td>1</td><td></td></tr> </table>	White,.....	2191		Black,.....	151		Yellow,.....	1		No record,.....	1		2344
White,.....	2191													
Black,.....	151													
Yellow,.....	1													
No record,.....	1													

The ratio of black to white has decreased during the current year. This is strange, and brings to light a social problem worthy of earnest consideration. Every inducement is offered to negroes to avail themselves of the treatment at the Phipps Institute, and there is absolutely no distinction made between the blacks and the whites. In spite of this, however, the blacks do not avail themselves of the opportunity for treatment. Tuberculosis is exceedingly prevalent among colored people, and the mortality among them is very high. They are careless in their habits, not over cleanly, and are therefore a menace to a com-

munity unless they can be brought under control and supervision. They now constitute the servant class of our community, and are therefore in intimate association with other people. How are we to reach them so as to be able to teach them preventive measures and make them live up to such measures for their own protection and that of others?

THE EYES.

Number of patients who had	{	Dark eyes,.....	227	} 885	} New cases.	
		Light eyes,.....	270			
		No record of color,.....	388			
		Pupils dilated,.....	208	} 885		
		Pupils not dilated,.....	399			
		No record of condition of pupils,.....	278			
		Pupils unequal,.....	55	} 885		
		Pupils equal,.....	728			
		No record of equality,.....	102			
Number of patients who had	{	Dark eyes,.....	1	} 477	} Old cases.	
		Light eyes,.....	6			
		No record of color,.....	470			
		Pupils dilated,.....	10	} 477		
		Pupils not dilated,.....	12			
		No record of condition of pupils,.....	455			
		Pupils unequal,.....	6	} 477		
		Pupils equal,.....	19			
		No record of equality,.....	452			

The eyes have been looked upon as an index of predisposition to tuberculosis and of progress of the disease. It has been claimed that people of light complexion are more prone to tuberculosis than those of dark complexion, and that when the disease has developed the pupils become dilated and sometimes one pupil becomes more dilated than the other. The color of the eye in a measure indicates the complexion of the individual and therefore may safely be used as a basis of study of the predisposing influence of complexion. As will be seen there is a slight preponderance of light-colored eyes, but when allowance is made for the number of cases in which there is no record in regard to

the color of the eyes it will have to be admitted that so far as this table means anything complexion does not count for much as a predisposing element in tuberculosis.

The matter of dilated pupils and of unequal pupils as symptoms in tuberculosis receives some support from the table, but only in regard to frequency of occurrence. No light is thrown upon the cause of the phenomena, nor upon their relationship to the disease. It is not even clear that they actually are symptoms of tuberculosis. Occurring as they do in some cases and not in others, it is possible and even probable that they may be due to mixed infection or some complication.

HEIGHT.

Males who were.....	{	Five feet eight inches or under,..	172	} 485	} 885
		Over five feet eight inches,	269		
		No record of measurements,	44		
Females who were.....	{	Five feet four inches or under,....	127		
		Over five feet four inches,	214	} 400	
		No record of measurements,.....	50		

In considering weight in tuberculosis one should always keep in mind the height of the individual and the relations between normal height and normal weight. Statistics have been taken on the height of the patients during the second year for the purpose, if possible, of bringing out any etiological relationship between height and the development of tuberculosis and of emphasizing the importance of gaging normal weight by height. Many people compute the normality or subnormality of their weights by the highest weight they have ever reached, and in this way are misled. A person who has never reached normal weight as determined by the height is apt to think that for him the weight which he has reached is normal, failing to realize that there may be a pathological condition responsible for his subnormal weight. He contents himself because he is not ostensibly ill, and thus permits the opportune time for recovery from a lurking disease to pass by. The probabilities are that all people who are con-

siderably below normal weight for their height are so on account of dormant tuberculosis.

As will be seen from the table, the majority of the people who have applied for treatment have been above the height which usually is laid down as the average height for men and women. In a measure this supports the prevalent idea that tallness is conducive to tuberculosis.

GENERAL APPEARANCE.

Number of patients whose general appearance was.....	{	Good,.....	370	} 885 new cases.
		Bad,.....	478	
		Not recorded,.....	37	
	{	Good,.....	36	} 477 old cases.
		Bad,.....	70	
		Not recorded,.....	371	

The traditional appearance of the tuberculous subject is that of emaciation. We have all been accustomed to think of the consumptive in the light of a worn-out, weak, tottering individual, and it is therefore difficult for us to reconcile ourselves to the existence of a tuberculous subject who looks well. This is due to the fact that until very recently we have not recognized tuberculosis except in the advanced stage of consumption. The table here given shows that a tuberculous subject often may look very well. Nearly one-half of the patients who apply for treatment are recorded as looking well. This does not mean either that all patients who looked well were in the incipient stage of the disease. It is surprising how far advanced a tuberculous subject may be and yet retain the appearance of physical well-being. Patients often look remarkably well even after the formation of large cavities in the lungs and the involvement of almost every organ in the body. This appearance of well-being usually occurs in people who have good stomachs and can digest almost any kind of food. Such people often carry an active tuberculosis through a long lifetime and ultimately die of an intercurrent disease.

OCCUPATION.

FOR THIS YEAR. TUBER- CULOUS.	FOR TWO YEARS. TUBER- CULOUS.	FOR THIS YEAR. TUBER- CULOUS.	FOR TWO YEARS. TUBER- CULOUS.
Abattoir employee,.....	1	1	12
Actor,.....	0	1	3
Agent,.....	2	7	82
Attendant in Insane Asy- lum,.....	0	1	9
Baker,.....	10	14	6
Barber,.....	4	18	1
Bartender,.....	3	17	3
Baseball-player,.....	0	1	6
Blacksmith,.....	5	12	3
Boilermaker,.....	6	11	1
Bookbinder,.....	4	8	8
Bookkeeper,.....	2	5	1
Bootblack,.....	0	1	1
Bowling alley attendant,.....	0	1	1
Boxmaker,.....	5	13	1
Brakeman,.....	1	7	3
Brass polisher,.....	0	3	544
Brewery hand,.....	1	3	9
Bricklayer,.....	4	3	1
Brickmaker,.....	1	8	4
Bridge builder,.....	1	2	1
Brushmaker,.....	0	3	19
Butcher,.....	2	2	2
Cabinet-maker,.....	3	8	1
Canvasser,.....	1	7	1
Capmaker,.....	2	4	1
Car conductor,.....	11	4	143
Carpenter,.....	15	16	22
Carriage-maker,.....	1	29	10
Cementer,.....	0	1	1
Chambermaid,.....	2	2	1
Chemist,.....	0	4	3
Child's nurse,.....	0	1	43
Cigarmaker,.....	10	2	1
Clerk,.....	32	37	5
Cloth examiner,.....	0	71	15
Coalyard employee,.....	0	1	2
Collector,.....	1	1	3
Color mixer,.....	0	4	100
Cook,.....	4	1	7
Cooper,.....	1	12	1
Coppersmith,.....	0	6	10
Courier,.....	0	1	10
Designer,.....	0	1	9
Draughtsman,.....	1	1	3
Driver,.....	26	1	4
Druggist,.....	0	67	3
Dyer,.....	5	1	1
Electrical worker,.....	3	15	6
Elevator employee,.....	3	6	1
Emery-wheel worker,....	1	6	1
Engineer,.....	3	2	1
Engraver,.....	1	1	
Factory hand,.....	26	1	
Farmer,.....	3	1	
Fireman,.....	0	1	
Fish-cleaner,.....	0	1	
Florist,.....	0	1	
Foundryman,.....	0	1	
Gardener,.....	2	1	
Gas works employee,....	1	1	
Glassblower,.....	4	1	
Glass-factory hand,.....	1	1	
Glazier,.....	1	1	
Harness-maker,.....	1	1	
Hospital orderly,.....	0	1	
Hostler,.....	2	1	
Houseworker,.....	224	1	
Huckster,.....	2	1	
Ice-cream vender,.....	0	1	
Ice-man,.....	1	1	
Ice manufacturer,.....	0	1	
Ironworker,.....	2	19	
Janitor,.....	0	2	
Jeweler,.....	1	1	
Laboratory employee,....	0	1	
Labor boss,.....	1	1	
Laborer,.....	47	143	
Laundry worker,.....	10	22	
Leather worker,.....	2	10	
Letter-carrier,.....	0	1	
Librarian,.....	1	1	
Lumberyard employee,..	0	3	
Machinist,.....	13	43	
Marble-worker,.....	0	1	
Mechanic,.....	3	5	
Merchant,.....	2	15	
Messenger boy,.....	0	2	
Metal-worker,.....	1	3	
Mill hand,.....	41	100	
Milliner,.....	3	7	
Millwright,.....	1	1	
Miner,.....	3	10	
Molder,.....	4	10	
Morocco finisher,.....	3	9	
Musician,.....	0	3	
Navy employee,.....	3	4	
Newspaper vender,.....	0	3	
Nickel plater,.....	0	1	
Nurse,.....	1	6	
Masseur,.....	1	1	
Motorman,.....	1	1	
Mover,.....	1	1	

OCCUPATION.—(Continued.)

	FOR THIS YEAR. TUBER- CULOUS.	FOR TWO YEARS. TUBER- CULOUS.		FOR THIS YEAR. TUBER- CULOUS.	FOR TWO YEARS. TUBER- CULOUS.
Office boy,.....	1	2	Soldier,.....	2	3
Officer Salvation Army, .	1	1	Spiceroom worker,.....	0	1
Oil works employee,.....	0	2	Stagehand,.....	0	1
Organ-builder,.....	0	1	Stenographer,.....	3	7
Oysterman,.....	0	3	Stevedore,.....	3	10
Packer,.....	5	11	Stoker,.....	0	2
Painter,.....	10	22	Stone-cutter,.....	4	15
Paperhanger,.....	2	11	Storekeeper's employee, .	1	12
Peddler,.....	3	13	Student,.....	9	11
Photographer,.....	1	2	Tailor,.....	21	80
Plasterer,.....	5	7	Teacher,.....	4	7
Plaster of Paris worker,...	0	1	Telegraph operator,.....	0	2
Plumber,.....	6	16	Telephone operator,.....	0	2
Policeman,.....	0	2	Tin-plater,	1	6
Poolroom attendant,	0	1	Tin-roofer,	1	5
Porter,.....	6	15	Tool sharpener,.....	0	1
Potter,.....	1	2	Turkish bath attendant, .	0	1
Presser,.....	6	13	Truss-maker,.....	0	1
Printer,.....	8	19	Type polisher,.....	1	1
Ragsorter,.....	2	5	Typewriter,.....	1	1
Rigger,.....	1	4	Upholsterer,.....	1	10
Riveter,.....	1	3	Undertaker,.....	0	1
Sailor,.....	1	7	Violin-maker,.....	0	1
Salesman,.....	5	16	Watchman,.....	3	7
Saleswoman,.....	6	14	Watchmaker,.....	1	4
Sawyer,.....	2	3	Waiter,.....	14	34
School-child,.....	39	80	Washerwoman,.....	3	9
Scrubber,.....	1	3	Weaver,.....	17	50
Scissors-grinder,.....	0	1	Wheelwright,.....	1	3
Seamstress,.....	18	42	Wine-dealer,.....	0	1
Sewing machine oper- ator,.....	7	12	Wood-chopper,.....	0	1
Shipper,.....	0	1	Wood-worker,	5	10
Shirt-maker,.....	2	7	Woolsorter,.....	1	1
Shoemaker,.....	9	19	No occupation,.....	22	42
Signalman,.....	0	1	No occupation given,....	26	58
				885	2344

In a general way the statistics on occupation are the same for the second year as they were for the first. In a few occupations there is an increase. For example, the number of car conductors has increased from six to eleven. This increase probably is due to the adoption of this occupation by consumptives under treatment because it is an outdoor occupation. Some of our physicians recommend this occupation to patients. There also has been a relative increase in school-children. This may be

due to earlier application for treatment and more general education on the subject of tuberculosis.

An analysis of the statistics for the two years points forcibly to the part which the house plays in the implantation and development of tuberculosis. House occupations were followed by most of the patients. Housework, mill work, factory work, cigar-making, barbering, bartending, sewing, shoemaking, tailoring, waiting, and weaving supply vastly the majority of the cases. A few outdoor occupations show a high morbidity, particularly those of laborer and driver. These occupations are of a low grade with very poor compensation, and herein, no doubt, lies the explanation of the high rate of morbidity. Occupations which have to do with cleaning and repairing things and places, particularly such things and places as may have been used or occupied by consumptives, show a high morbidity. Of this kind of occupations there are, for example, those of paperhanger, clothes presser, and rag-sorter. As a general rule, there is close association between the morbidity rate of tuberculosis and indoor life, hardship, and want.

WORK.

New cases,	Who worked indoors,.....	389	} 885	} 1362
	Who worked outdoors,.....	62		
	Who did not work,.....	385		
	No record,.....	49		
Old cases,.....	Who worked indoors,.....	87	} 477	
	Who worked outdoors,.....	14		
	Who did not work,.....	151		
	No record,.....	225		

As a rule, the tuberculous subject works during the greater part of his illness. This is especially true among the poor. Tuberculosis by itself does not incapacitate for work until much tissue has been destroyed and mixed infection has set in. Herein lies the chief cause of fatality in the disease. Did the victim rest from toil and activity early in the disease, most cases would get well of their own accord. Of the patients treated, about one-

half were working. Strange to say, most of them were working indoors. With the modern teachings about tuberculosis one would expect that the people suffering from the disease would seek outdoor employment. Outdoor employment is recommended by the Institute, but it has been difficult to bring about the adoption of this recommendation. The obstacle in the way is lack of opportunity for outdoor employment. With many of the poor it is a question of getting relatively easy employment with sufficient compensation to relieve hunger. The immediate pressing need is the prevention of starvation, and in the presence of this a future death from the disease has no terrors.

EARNING CAPACITY OF PATIENTS.

Patients working,	{	New cases, 885,	Who were earning something, 349	{	Total earnings per day, \$470.62
			Who were earning nothing, 215		Average earnings per day, \$1.348
			Of whose earnings no record was made, 321	{	Total earnings per day, \$44.32
			Who were earning something, 37		Average earnings per day, \$1.22
	{	Old cases, 477,	Who were earning nothing, 24	{	Total earnings per day, \$44.32
			Of whose earnings no record was made, 416		Average earnings per day, \$1.22
			Who were earning something, 37	{	Total earnings per day, \$44.32
			Who were earning nothing, 24		Average earnings per day, \$1.22

One can read out of the earning capacity of the average tuberculous subject who applies at a dispensary for treatment the indirect cause of his disease, the difficulties in the way of his recovery, and a homily on preventive medicine as a sociological problem. The average income given in the table will not enable a person who is in health to live in our country in such a way as to remain healthy, and much less will it enable a person suffering from a chronic ailment to get well. Food and housing are important factors in both the prevention and the treatment of tuberculosis. They both are high priced. Food is plentiful and

good housing is available. A great work lies before the sociologist in this connection. It is his duty to bring about a more economical and even distribution of these commodities.

SICK BENEFITS.

Patients, 885,.....	Who got sick benefits,....	88	{ Total benefits per week,\$392.48 Average benefits per week,..... \$4.46
	Who did not get sick benefits,.....	663	
	No record,.....	134	

Statistics on sick benefits are only given for the new cases, as the record was not taken for the old cases. In future, statistics on this subject will be taken for all cases.

Industrial insurance evidently has not yet gotten a foothold among the laboring classes in our country, or else it lapses before the insured becomes a beneficiary. Scarcely ten per cent. of those who came under treatment drew sick benefits. This want of provision for a rainy day by the laboring classes makes the crusade against tuberculosis a more difficult problem in this country than it is in countries in which industrial insurance is universal. In Germany, where industrial insurance is compulsory, for example, there has been ample means at hand from the very beginning of the crusade for the establishment of sanatoria. In that country every one with tuberculosis in a curable stage can be compelled to go to a sanatorium, and the money is at hand for his maintenance. As a matter of social economy compulsory industrial insurance should be introduced in every civilized country.

DEPENDENTS.

New cases,	Who had others to support,	420	885	1362
	Who did not have others to support,.....	406		
	Of whom there was no record as to others to support,	59		
Old cases,.....	Who had others to support,.....	44	477	
	Who did not have others to support,.....	34		
	Of whom there was no record as to others to support,	399		

Nearly one-half of the patients who applied for treatment had others depending on them for support. When one takes into consideration the small number who received sick benefits and the small number who had even a meager earning capacity one gets a glimpse of the magnitude of the tuberculosis problem. What must be the future of a dependent who leans upon a sick person with an income of from five to eight dollars a week? How can he escape tuberculosis? How can he escape pauperism and crime? It is from this class of dependents that the population of our eleemosynary institutions of all kinds is kept up. It also is from this class of dependents that our penal institutions, reformatories, and even insane asylums get their recruits.

SICKNESS IN THE HOME.

New cases,	Who had others sick in the home,.....	75	} 885
	Who did not have others sick in the home,.....	358	
	Of whom no record was made as to others being sick in the home,.....	452	
Old cases,.....	Who had others sick in the home,.....	52	} 477
	Who did not have others sick in the home,.....	183	
	Of whom no record was made as to others being sick in the home,.....	242	

With the very poor sickness in the house often is a perpetual cloud which gets darker or lighter from time to time but never raises. The probabilities are that in the home of the poor consumptive every inmate has tuberculosis in some form and in some stage. Usually only one at a time is far enough advanced in the disease to be regarded as sick. Sometimes, however, two and even three at a time have the disease in an active form and have to seek relief. The Institute occasionally has two and three members of the same family under treatment at the same time. The distress under these circumstances is very great. Recovery is almost impossible. Removal from the home into a hospital or sanatorium under such circumstances is necessary for the accomplishment of favorable results. Not until provision for

institutional treatment of all such cases has been made will the crusade against tuberculosis be on a sound footing.

ALCOHOLISM.

New cases,	{	Alcoholism in patient,	193	}	Out of 885 cases.
		No alcoholism in patient,	648		
		No record,	44		
		Alcoholism in preceding generation, ..	199		
		No alcoholism in preceding generation, ..	603		
		No record,	83		
Summary for two years, {	No alcoholism in either patient or preceding generation,	548	}	Out of 2344 cases.	
	Alcoholism in patient,	475			
	Alcoholism in preceding generation, ..	413			

From a sociological point of view it is of importance to determine definitely the relationship between alcoholism and tuberculosis. From time immemorial it has been held by the people that alcohol is a protection against tuberculosis and has curative value when the disease has been established. Medical men and sociologists have in recent years taken very opposite ground upon this subject to that held by the populace. Many eminent men hold that alcoholism is a strong predisposing cause of tuberculosis, and it is now generally agreed upon by experts in the treatment of tuberculosis that the use of alcohol should be prohibited to all tuberculous people. It even has been suggested that the crusade against alcoholism and the crusade against tuberculosis should join hands for mutual aid. The prevention of tuberculosis and the prevention of alcoholism undoubtedly merit the most hearty support of all who are interested in the welfare of society, but it may be well to be somewhat careful about linking the two movements together before it has been demonstrated that the two evils bear a mutual etiological relationship one to the other. So far we have no definite data warranting such a conclusion. The figures which the Institute is able to give upon the subject certainly would not warrant the conclusion. It must, moreover, be borne in mind that tuberculosis may be a potent cause of alcoholism, and that this may be the relationship

between the two evils rather than that alcoholism is the cause of tuberculosis. For the present the subject must be an open one.

PREVIOUS DISEASES.

New cases who gave a history of having had	Typhoid fever,.....	166	} Out of 885 cases.
	Pneumonia,.....	166	
	Pleurisy,.....	202	
	Influenza,.....	306	
	Measles,.....	507	
	Malaria,.....	137	
	Whooping-cough,.....	304	
	Smallpox,.....	30	
	Scarlet fever,.....	122	
	Diphtheria,.....	78	
	Diabetes,.....	8	
	Syphilis,	42	
	Rheumatism,	165	
	Gout,.....	6	
Summary for two years,.....	Persons who gave a history of having had.....		} Out of 2344.
	Typhoid fever,.....	401	
	Pleurisy,.....	584	
	Pneumonia,.....	458	

In the First Annual Report of the Henry Phipps Institute we gave statistics under the heading of predisposing diseases. More light upon this subject has induced us to change this heading to previous diseases. It is still an open question whether the diseases which have in the past been looked upon as predisposing to tuberculosis really do predispose. It is even possible that some of them instead of predisposing may give a partial protection. The entire subject must remain an open question until more light has been thrown upon it. A very striking feature of the statistics here given, from which, however, it is not safe to draw conclusions as yet, is the small number of people with tuberculosis who have had gout and the large number who have had measles and influenza. The number of people who give a record of having had pleurisy is not so large for the second year as it was for the first. Pleurisy, however, still stands at the head of the list of previous diseases for the two years. A side light comes from the small number of people who have had smallpox and syphilis. Considering the rarity of diabetes the number of

patients who have had this disease is rather large, thus in a measure confirming the suspicion which has been in the minds of medical men that there may be some relationship between diabetes and tuberculosis.

PREVIOUS TUBERCULOSIS.

Number of patients who had evidence of previous tuberculosis,...	New cases, .	In glands,	37	} Out of 885.
		In bones,	15	
		In both glands and bones,	5	
	Old cases, .	In glands,	5	} Out of 477.
		In bones,	2	
		In perineum,	1	

The statistics here given deal with active tuberculosis. By previous tuberculosis is meant tuberculosis which was active and subsided. Even in this restricted sense the number of cases recorded as having had previous tuberculosis is exceedingly small, in all probability smaller than the facts would warrant. It is pretty difficult at times to bring to light evidence of previous tuberculosis even when it has existed, and it is quite possible that some such evidence has been overlooked by the examiners.

CONDITION OF THE THROAT.

Number of patients who were recorded as having the throat	New cases.	Congested,	360	} 885
		Not congested,	357	
		No record,	168	
		Inflamed,	104	} 885
		Not inflamed,	511	
		No record,	270	
		Pale,	157	} 885
		Not pale,	529	
		No record,	199	
	Old cases.	Congested,	26	} 477
		Not congested,	23	
		No record,	428	
		Inflamed,	14	} 477
		Not inflamed,	32	
		No record,	431	
		Pale,	5	} 477
		Not pale,	41	
		No record,	431	

In the popular mind there is a very close relationship between sore throat and consumption. Many people think that when one has a sore throat unless he is careful the soreness in the throat will extend down into the lungs and develop consumption. The reasoning is wrong. An ordinary sore throat cannot extend down and produce tuberculosis of the lungs. As is often the case, however, there is a grain of truth in the popular idea on this subject. The most recent scientific research shows that the throat may be the gateway of disease germs into the lungs and that a throat trouble which in itself is not tuberculous may indirectly be responsible for an implantation of tuberculous disease in the lungs.

In the table here given the word throat is made to cover the entire pharynx, but does not include any of the organs which cannot be seen with the naked eye and without a mirror. The table shows that a great many patients had congested throats, that some had inflamed throats, and that others had pale throats. The congested throats and the inflamed throats indicate an infection of the mucous membrane with some microorganism which grows readily in these tissues and which often becomes a partner with the tubercle bacillus in mixed infections. The pale throat indicates a past struggle with disease germs. The tonsils, the adenoid tissue of the post-nasal pharynx, and the mucous membrane of the nasopharyngeal tract all are important tissues to study in tuberculosis, and undoubtedly will receive more attention in the future than they have in the past.

The figures given in this table should be studied in connection with the laryngological report. A comparison will show how few of the throat troubles complained of by consumptives are tuberculous.

This table may also be profitably compared with the table on hoarseness. The comparison will throw some light on the frequency of temporary hoarseness in tuberculosis as compared with persistent hoarseness.

SOURCE OF CONTAGION.

New cases,.....	{	Preceding generation,.....	179	} Out of 885 cases.
		Immediate generation,.....	190	
		Succeeding generation,.....	23	
		Consort's family,.....	69	
		Fellow employees,.....	78	
		Contaminated houses,.....	54	
		Source not discovered,.....	370	
		No record,.....	37	
		More than one source,.....	115	
Summary for two years,	{	Preceding generation,.....	552	} Out of 2344 cases.
		Immediate generation,.....	468	
		Succeeding generation,.....	64	
		Consort's family,.....	243	
		Fellow employees,.....	165	
		Contaminated houses,.....	112	
		Source not discovered,.....	981	
		No record,.....	101	
		More than one source,.....	340	

The manner in which tuberculosis is conveyed from one person to another is a subject of vital interest to both the physician and the sociologist. There is some definite knowledge at hand upon the subject, but the matter is not yet settled. Exact knowledge is hard to get. Information upon sources of contagion is often wilfully withheld and perhaps still more frequently unconsciously suppressed. With some races, especially the Celts and Hebrews, there is a strong prejudice against a record of having tuberculosis in the family, and when such is the case with the individual under examination, it is almost impossible to get a correct record of the cause of death of ancestors. The long dormancy of tuberculosis also adds difficulties. Implantation often takes place in childhood and development of the disease in middle life or old age. Under these conditions it is not to be wondered at if the patient cannot give a history of exposure.

A comparative study of our report for two years shows that with more experience our examiners were able to bring out the history of contagion better during the second year than during the first. In nearly two-thirds of the cases of the second year a source of contagion was discovered. Family relationship still stands at the head of the list of factors in the spread of

tuberculosis. More than half of the cases contracted the disease from another member of the family either nearly or distantly related. The number of cases which show implantation through occupation of infected houses and through association with fellow employees is surprisingly small. All the data given in the tables indicate that the implantation of the tubercle bacillus is not an easy matter, and that it takes long intimate contact for an implantation—the kind of contact which one gets in family relationship. This, moreover, is in harmony with what we know from other sources about tuberculosis and the tubercle bacillus. Tuberculosis no doubt got its reputation as an hereditary disease from this mode of implantation. The most striking feature of the disease at all times has been its close association with the family tree and the natural popular deduction from this was that the disease was inherited. All the studies which have been made of the tubercle bacillus indicate that it dies very quickly from exposure to sunlight and air, that it is somewhat difficult to implant, and that it is fastidious in the selection of its soil. From laboratory work one would expect that it would take a long intimate exposure to infection for an implantation in the average human being.

PLACE OF BEGINNING OF TUBERCULOSIS OF THE LUNGS.

New cases,	{	Right apex,.....	503		
		Left apex,.....	127		
		Not determined,.....	255		885
Summary for two years,	{	Right apex,.....	1460		
		Left apex,.....	582		
		Not determined,.....	302		2344

It has been of interest to the medical profession to determine which part of the lung first becomes the seat of tuberculosis. Exact data upon the subject are difficult to obtain, inasmuch as extensive destruction of tissue usually has taken place when death occurs and a case comes to autopsy. Such data as we can get are, there-

fore, necessarily deductive and must be accepted as such. We know that tuberculosis is a slow, progressive disease, beginning at one point and gradually extending to others. The most advanced lesion, therefore, usually may be accepted as the earliest lesion. Sometimes it is difficult to determine which the most advanced lesion is, inasmuch as the terminal stage of the lesion may be fibrosis and not broken-down tissue. If the first lesion ends in fibroid tissue and recovery and the second lesion ends in cavity formation and recovery, it is very easy to mistake the second lesion for the first, and this is still more true when the process goes on to extensive destruction of tissue and death. In spite of these sources of error, however, a fair inference can be drawn from the statistics here given, especially since they corroborate the view which always has been held by the medical profession that the apex of the right lung is the primary seat of tuberculosis more frequently than any other part of the lungs. Why the right apex should be the most frequent place of beginning of tuberculosis of the lungs has never been satisfactorily explained.

TISSUE INVOLVED.

New cases,	{	One lung,.....	252	} Out of 885 cases.
		Both lungs,.....	563	
		Three lobes,.....	150	
		More than three lobes,.....	196	
		Abdominal organs,.....	117	
		Other organs,.....	90	
		No record,.....	70	
Summary for two years,	{	One lung,.....	694	} Out of 2344 cases.
		Both lungs,.....	1369	
		Three lobes,.....	447	
		More than three lobes,.....	481	
		Other organs,.....	319	
		No record,.....	281	

The table indicating the amount of tissue involved in the cases which have applied for treatment in the Henry Phipps Institute gives a graphic picture of the advancement of tuberculosis under ordinary circumstances before treatment is sought. Out of this picture we also can read the explanation of the fatality of tubercu-

losis and the pessimism of the average physician upon the question of curability of tuberculosis. It is quite evident that tuberculosis, in spite of the fact that it is a tissue destroyer, does not attract much attention,—does not manifest itself in the beginning by symptoms pronounced enough to attract attention,—and does not greatly discommode its victims. The average physician does not recognize tuberculosis in a stage earlier than that in which tissue has been destroyed,—in all probability is rarely consulted in an earlier stage,—and consequently does not see cases recover. Quite naturally he formulates his views upon his own experience, and looks upon the disease as incurable. He does not realize that tuberculosis has an earlier stage in which it is easily curable, and that this stage may be found even in the cases which consult him for stomach trouble, neurasthenia, malaria, and many undefined conditions passing current under some convenient name which means nothing. Could all cases of tuberculosis come under treatment when either only one part of one lobe of one lung is involved or the disease is still confined to the lymphatic glands or to a single organ of the body, there would need be no mortality from tuberculosis.

A comparison of this table with the table in the pathologist's report giving the involvement of the lungs in those cases which came to autopsy will show that the clinical picture drawn is under-toned. It does not represent the cases in as far advanced a condition as they really were. It is especially deficient in the items of abdominal organs and other organs. The mesenteric glands, the intestines, the kidneys, the liver, the peritoneum, and the reproductive organs often become tuberculous long before the terminal stage of tuberculosis. The involvement of these organs produces so few symptoms in many instances that the condition remains undiscovered. This is particularly true of tuberculosis of the intestines. Tuberculosis of the internal lymphatic glands is also frequently overlooked.

DISTURBANCE OF THE ALIMENTARY CANAL.

New cases,	{	Who were recorded as having had the tongue.....	{	Coated,	511	}	{	Out of 885 cases.
				Clean,.....	307			
				No record,	67			
				Dry,.....	48			
				Moist,.....	297			
				No record,	540			
	{	Who were recorded as having had....	{	Appetite,.....	521	}	{	Out of 885 cases.
				No appetite,...	349			
				No record,....	15			
		Who were recorded as having had....		Gastric disturb-			{	Out of 885 cases.
			ance,	416				
			Costive bowels,	295				
				Diarrhea,.....	111			
	{	Who were recorded as having had the tongue.....	{	Coated,.....	33	}	{	Out of 477 cases.
				Clean,.....	30			
				No record,....	414			
				Dry,.....	4			
				Moist,.....	12			
				No record,....	461			
Old cases,.....	{	Who were recorded as having had....	{	Appetite,.....	143	}	{	Out of 477 cases.
				No appetite, ...	121			
				No record,.....	213			
		Who were recorded as having had....		Gastric disturb-			{	Out of 477 cases.
			ance,.....	84				
			Costive bowels,	61				
				Diarrhea,.....	76			
Summary for two years,.....	{	Who were recorded as having had	{	Diarrhea,.....	269	}	{	Out of 2344 cases.

There is a very close relationship between the lungs and the upper part of the alimentary canal, and there is a very close sympathetic relationship between the upper part of the alimentary canal and the lower part. It is not to be wondered at, therefore, that in tuberculosis of the lungs disturbance of the alimentary canal occurs in various forms.

Very early in the disease the tongue frequently is coated and manifests other conditions away from the normal. Early in the disease, too, the appetite often is lost, perhaps even more frequently than later in the disease. The table here given shows that there is good appetite more frequently than bad, and yet this may be misleading inasmuch as these statistics deal with fairly advanced cases and with people who are underfed.

Quite a large number of cases are recorded as having had gastric disturbance, by which is meant some discomfort during the process of digestion. The bowels often are costive, and they are occasionally loose. Costive bowels and diarrhea occur alternately in the same patient in many instances, and the two conditions may be due to the same cause. There is reason to believe that the loose bowels are sometimes caused by an effort of nature to supplement the action of the kidneys, which have been injured by the disease. Both costive bowels and diarrhea may be present when there is no ulceration of the bowels, and may be absent when there is ulceration of the bowels. It may be, too, that the condition of the mesenteric glands influences the bowels and may determine the character of the stools. A summary of the diarrheas is given for the two years, and shows that the percentage of cases which have diarrhea is relatively small. No summary is given for the other items in the table because statistics on those items were not taken during the first year.

DISTURBANCES OF THE SYMPATHETIC NERVOUS SYSTEM.

		Who were recorded as having had chills at one time or another.....	369 ..Out of 885 cases.
New cases, ..	Whose temperature when taken	Remained below 100,.....	528
		Went to 100 and over,.....	319
		No record,.....	38
	Whose pulse when taken	Remained below 100,.....	427
		Went to 100 and over,.....	410
		No record,.....	48
	Whose respiration when taken.....	Remained below 30,.....	581
		Went to 30 and over,.....	255
		No record,.....	49
	Who were recorded as having had shortness of breath,.....		697 ..Out of 885 cases.

	Who were recorded as having had chills at one time or another,.....	59 ..Out of 477 cases.		
Old cases,...	Whose temperature when taken.....	Remained below 100,.....	104	} 477
		Went to 100 and over,.....	225	
		No record,.....	148	
	Whose pulse when taken.....	Remained below 100,.....	222	} 477
		Went to 100 and over,.....	191	
		No record,.....	64	
	Whose respiration when taken.....	Remained below 30,.....	123	} 477
		Went to 30 and over,.....	235	
		No record,.....	119	
	Who were recorded as having had shortness of breath,	149 ..Out of 477 cases.		

During the second year of the Institute's work an effort has been made to get some idea of the frequency of such symptoms as chills, change of temperature, pulse-rate, and respirations. It is very difficult to get reliable data upon these subjects, because different individuals react so differently in matters of this kind and there is such a variation in these symptoms according to the time when the record is made. The figures, however, give a fair picture of the sympathetic disturbances in tuberculosis. Chills are recorded much less frequently than one would expect, taking into consideration the fact that in tuberculosis there is always some change in the temperature. It would look as though the chills did not properly belong to the tuberculous process, but were more likely an evidence of a mixed infection. The record of temperature-range is also somewhat surprising, although perhaps more in harmony with what one would expect in tuberculosis. The temperature-range of tuberculosis evidently is not a wide one. It is, indeed, quite possible that when the temperature goes above 100 the rise is due to a mixed infection, and not to the tuberculous toxin.

The pulse undoubtedly is more readily disturbed by the tuberculous toxin than is the temperature. All tuberculous subjects apparently have some rise in pulse-rate, and a great many have a considerable rise. The table shows that nearly one-half had a pulse-rate of upward of 100.

The respiration is apparently less readily disturbed in tuberculosis than the pulse. Nearly two-thirds of the patients had a respiratory rate of less than thirty. Making some allowance for disturbance of respiration during examination, it is remarkable that the respiratory rate should be so low in a disease which affects respiratory organs. Evidently the mechanical interference in tuberculosis is not a very serious matter.

DISEASES OF THE CIRCULATORY SYSTEM.

New cases,.....	{	Aortic stenosis,....	8	}	Out of 885 cases,.....	{	Number of cases with circulatory disturbance,....	470
		Aortic regurgitation,.....	7				Number of cases without circulatory disturbance,	379
		Mitral stenosis,....	14				No record,.....	36
		Mitral regurgitation,.....	27					
		Dilated right heart,	56					
		Arteriosclerosis, ...	30					
		Accentuated aortic second sound,....	194					
		Accentuated pulmonary second sound,.....	321					
Summary for two years,.....	{	Aortic stenosis,....	15	}	Out of 2344 cases.	{		
		Aortic regurgitation,.....	10					
		Mitral stenosis,....	39					
		Mitral regurgitation,.....	73					
		Dilated right heart,	84					
		Arteriosclerosis, ...	57					
		Accentuated second sound,.....	858					

There is perhaps nothing in physical diagnosis more difficult than to make out definitely the character of the disturbance of the circulatory system. Major heart lesions are easily enough discovered and defined; minor heart lesions, however, and functional disturbances are much more difficult to make out. It will

be noticed that a larger number of circulatory disturbances, relatively speaking, at least, are recorded for the second year than were recorded for the first year. The increase is due entirely to the greater skill of the examiners, which has come from practice and training. A comparison of the statistics given in this table with the statistics given in the table of heart lesions of the autopsy report will show that most of the circulatory disturbances in tuberculosis are functional. The most frequent disturbance recorded and the one which perhaps is most peculiar to tuberculosis is accentuated pulmonic second sound. Accentuation of both second sounds is of frequent occurrence in tuberculosis, but an accentuation of the pulmonic second sound predominates. While this is a mere symptom, it indicates in a measure the burden which is thrown upon the heart in tuberculosis and to some extent explains the rapid heart action. With increased experience of our staff we hope to be able to give better records upon this interesting topic as time goes on.

URINARY ABNORMALITIES.

New cases, 885,.....	{	Recorded as having had	{	Sugar,	7
		urine examined,..... 495		Albumin,.....	106
	{	With no record of having	{	Casts,.....	37
		had urine examined,... 390		Diazo,.....	60
Summary for two years, 2344,	{	Recorded as having had	{	Sugar,	13
		urine examined,..... 656		Albumin,.....	153
		With no record of having			
		had urine examined,...1688			

During the second year the urinary analysis was made in a much larger number of cases than during the first. The examinations also were made more carefully. The percentage of pathologic findings, however, remains about the same. Comparison of the table here given with the table on kidney lesions in the autopsy report shows that tuberculous lesions of the kidneys do not manifest themselves in a marked degree by ordinary pathological findings in the urine. Tubercle bacilli have not been looked for in many cases, and the findings are not

reported here. Some good work has been done along this line, however, in the Institute, and this will be reported in a separate article.

PAIN.

Number of patients who at one time or another suffered pain,.....	{	New cases,.....	628, Out of 885.
		Old cases,.....	243, Out of 477.

Pain is not usually thought of as an accompaniment of tuberculosis, and, as a rule, the consumptive gets very little sympathy on this score. It is surprising, however, how many patients are recorded as suffering from pain. It apparently is the most frequent symptom recorded. The pain is usually referred to some part of the chest, but sometimes to the extremities. The most frequent cause of pain undoubtedly is pleurisy. Almost all persons who have tuberculosis of the lungs have pleurisy in some degree. The pain, however, may be due to a toxic neuritis, and, when it occurs in the extremities, usually is due to such a cause.

HOARSENESS.

Number of patients who had hoarse- ness,.....	{	New cases,.....	{	Persistent,..... 113	} Out of 885 cases.
			Temporary, ... 412		
	{	Summary for two years,.....	{	Persistent, 299 ..	} Out of 2344 cases.
			Temporary, ... 412 ..	Out of 885 cases.	

Hoarseness occurs frequently in tuberculosis. Usually it is temporary in character, but sometimes it is persistent. During the first year we recorded persistent hoarseness only; during the second year temporary hoarseness as well. Why tuberculous people become hoarse more readily than non-tuberculous people is not apparent. It is probably on account of greater susceptibility to colds of various kinds and a certain amount of nervous depression. Temporary hoarseness probably is always due to intercurrent conditions. Permanent hoarseness usually is due to tuberculous invasion of the larynx.

HEMOPTYSIS.

Number of patients who had hemoptysis at one time or another,.....	{	New cases,.....	401, Out of 885.
		Summary for two years,...	1130, Out of 2344.

Our table shows that nearly one-half of the patients who apply for treatment have expectorated blood or blood-streaked sputum at one time or another during the course of the disease. This large percentage of cases gives some support to the popular idea that blood-spitting is a common symptom in tuberculosis of the lungs. With the people, blood-spitting means consumption sooner or later, and usually is one of the first symptoms which causes alarm. So long as a tuberculous subject has not spat blood, he is able to persuade himself that he has not consumption, but after he has spat blood, he takes it for granted that he has the disease. There is really more reason for this popular verdict than one would at first sight think. Blood-spitting is undoubtedly, in some cases at least, due to mixed infection, and frequently occurs with breaking down of tissue. When it comes, therefore, the disease either is well established or the mixed infection leads to rapid progress; and, no doubt, experience has shown the populace that blood-spitting usually is followed by a speedy development of the disease. Hemoptysis is under investigation at the Institute, and an interesting report will probably be made upon the subject in the next annual report.

NIGHT-SWEATS.

Number of patients who had night-sweats at one time or another,.....	{	New cases,.....	510, Out of 885.
		Summary for two years,...	1389, Out of 2344.

Night-sweats, like blood-spitting, are peculiarly a symptom of consumption in the popular mind. Often a person with a cough rests easy in mind until he gets a night-sweat, and then jumps at the conclusion that he has consumption. Night-sweats, however, are not caused by consumption alone, although

they undoubtedly are caused more frequently by consumption than by any other disease or condition. That they do occur frequently in tuberculosis is shown by the table here given. It has not yet been demonstrated what night-sweats are due to, but it is assumed with good reason that they are caused by a toxin of some kind. This view is in a measure borne out by the experience of the Institute in that night-sweats practically cease in all cases when the patient is put at rest and properly fed and housed. It remains to be shown what the toxin is which produces sweats, and why it acts under conditions of bad housing, bad feeding, and overexertion, but not under conditions of good housing, good feeding, and rest.

ATROPHY OF THE SCAPULAR MUSCLE.

Number of patients who had the scapular muscles most atrophied,.....	On the right side,.....	182	} 885
	On the left side,.....	66	
	On neither side,.....	528	
	No record,.....	109	

In text-books on physical diagnosis contraction of the scapular muscles of the affected side is usually referred to. What this atrophy is caused by and what it means has never been clearly determined. The table here given shows that it is not a frequent symptom. Contraction of the chest over a cavity may be accompanied by atrophy of the scapular muscles, and from the relative number of cases here recorded one would be led to think that this is probably the cause of it. It may be, however, that the nutrition of the muscles is affected by the disease of the lungs, and that the atrophy precedes the formation of a cavity.

EDEMA.

Number of patients who were recorded as having edema,.....	New cases,.....	160, Out of 885 cases.
	Summary for two years, 399,	Out of 2344 cases.

Considering the frequency of kidney disease in tuberculosis, it is surprising that so few patients develop edema. This surprise becomes still greater when we consider the circulatory disturbance

which always occurs in tuberculosis. It may be that the slowness of the progress of tuberculosis accounts for this strange combination of symptoms in that the whole organism has time to accommodate itself to the gradual change which takes place in the affected organs. The subject presents a very interesting field for study and investigation.

FREEDOM FROM COUGH.

New cases,.....	{	Tuberculous,.....	52	}	Out of 1067 cases.
		Non-tuberculous,.....	24		
Summary for two years,.....	{	Tuberculous,.....	83	}	Out of 3107 cases.
		Non-tuberculous,.....	49		

There is perhaps no symptom in tuberculosis more frequently misunderstood and misinterpreted than that of cough. With many people cough and consumption are synonymous. With them cough means consumption and no cough means no consumption. This view of the matter is misleading, and, unfortunately, is often shared by the physician. In truth, tuberculosis of the lungs in itself does not produce much cough, and, as the table here shows, may be entirely free from cough. The cough which accompanies tuberculosis of the lungs is most frequently caused by a mixed infection of some kind or another. The only time when the tuberculous process itself produces cough is when there is broken-down tissue to come away, and then the cough is profitable. It is indeed surprising how much tuberculous infiltration there may be in the lungs without a reflex disturbance strong enough to produce a cough. This is particularly true of people at rest. This strange phenomenon is explicable by the physiologic excess of lung tissue above that which is necessary for the ordinary needs of life. It is only when an individual with infiltration of some of his lung tissue takes exercise or does something which calls into action his reserve lung power that much cough is set up. A hint is here given us for the control of the cough in the treatment of tuberculosis. Rest and mental control are ordinarily all that are needed to check excessive cough.

Control of cough by opiates is undoubtedly a therapeutic mistake—one which is often made.

TUBERCLE BACILLI IN SPUTUM.

Number of patients, ..	{	For this year, 885,	Recorded as having had sputum examined ...	{	Once, 463 More than once, .. 94	{	Bacilli present, . 361 Bacilli absent, . 196
			With no record of sputum examination,				
	{	For two years, 2344,	Recorded as having had sputum examined....	{	Once, 937 More than once, .. 94	{	Bacilli present, . 679 Bacilli absent, . 352
			With no record of sputum examination,				

The table here given recording the sputum examinations does not give a complete picture of the work done at the Institute along these lines. Unfortunately, many sputum examinations which have been made have not been recorded, usually because they were negative. This in a measure lessens the value of the statistics given, because we do not get a correct idea of the number of examinations with a negative finding. But even incomplete as the picture is, it conveys a very useful lesson in the diagnosis of tuberculosis. Since bacteriology has come to our assistance in the diagnosis of disease there has been a very strong tendency on the part of the profession to depend upon the laboratory for diagnostic data, and perhaps the more so because the laboratory uses exact methods. It is true that the laboratory gives us absolutely correct conclusions when the findings are positive, but unfortunately positive findings cannot always be had. Moreover, in tuberculosis positive findings only are possible when the disease has gone far beyond the incipient stage and destruction of tissue has already taken place. But even when this stage has been reached, tubercle bacilli are not always found in the sputum, and frequent search has to be made in many cases before they are found. The art of physical diagnosis when well acquired

reveals the presence of tuberculous infiltration in the lungs before there is broken-down tissue and before tubercle bacilli can appear in the sputum, and, therefore, is of much greater value for diagnostic purposes than the laboratory. This fact should be constantly kept in mind by the medical schools in the training of young men for the practice of medicine.

DURATION OF THE DISEASE.

Number of cases,...	{	New cases,	{	Less than 2 years,.....	434	} 885
			2 to 5 years,.....	246		
			5 to 10 years,.....	87		
			10 to 20 years,.....	52		
			Over 20 years,.....	11		
			No record,.....	55		
		Summary for two years,	{	Less than 2 years,.....	1072	} 2344
			2 to 5 years,.....	725		
			5 to 10 years,.....	248		
			10 to 20 years,.....	161		
			Over 20 years,.....	41		
			No record,.....	97		

The more we learn about tuberculosis, the more apparent it becomes that the disease is always one of long duration. A comparison of the cases for the second year with the cases for two years will show that during the second year a history of a longer duration of the disease was brought out by the examiners than during the first year. This is due to experience in examining cases. It is very difficult to bring out the correct history of duration of the disease in many cases because people unconsciously suppress information about manifestations of the disease in early life, either through forgetfulness or through prejudice against a record of having had tuberculosis in the family. Real scientific research into the duration of tuberculosis is only beginning. In the past, medical men have usually measured the duration of the disease by the period of mixed infection, and to a very great extent this is still done. The correct duration of the disease, however, should be measured from the implantation, and this implies a long period of dormancy in most cases. The probabilities are that tuberculosis is always primarily a lymphatic disease, and that

the lymphatic period is always dormant except when the disease manifests itself by an enlarged superficial gland. The best way to get a correct idea of the duration of the disease is to measure the time from the exposure to contagion, if this can definitely be made out, and to measure it from the first marked loss of weight when the exposure cannot be determined. The figures given in the tables here undoubtedly understate the duration of the disease.

AID GIVEN.

New cases,	{	Who received milk,	398	}	Out of 885.
		Who received preventive measure supplies,	561		
Old cases,	{	Who received milk,	319	}	Out of 477.
		Who received preventive measure supplies,	360		

Milk is given to dispensary patients when, in the judgment of the physician, they are too poor to buy it. This milk is usually served from depots. In parts of the city it is served by a milkman. When it is served from depots the patient either comes or sends for it. Alphabetic card-indexes of those who are entitled to milk are each morning taken to the depots by the nurses who give out the milk, and each patient is identified by an assistant before he gets his milk. When the party presents himself he calls out his name. If the name is found in the index, he is given the amount of milk indicated on the card. This system is the most satisfactory of those tried so far. No system will guard against fraud altogether, but it is believed that this one does so pretty nearly.

Many of the patients probably do not use the milk which is given them. Some give it to other members of the family, and some perhaps even sell it. Every effort which can be made in a practical way is made by the Institute, to guard against abuse of the charity which is extended to its beneficiaries. It is impossible, however, to prevent the misuse of milk. When the milk is used for members of the family, especially children, no action is taken, as such use is in the interest of prevention; when, however, there is suspicion of the milk being sold, it is stopped.

Preventive measure supplies are given to all patients who will accept them. An effort is made to induce all patients to accept them. These preventive measure supplies consist of a tin spit-cup holder, paper spit-cups, paper napkins, paper bags, and occasionally lye. Lye is given to those patients who have no facilities at home to burn spit-boxes; and these patients are instructed to use china cups as receptacles for the expectorated matter. Directions are given to put some of the lye and some water in the cups, expectorate into this solution, and at intervals empty the contents of the cup into the water-closet. The cups are directed to be scalded after each emptying. Considerable pressure is brought to bear on patients to induce them to practise preventive measures when they seem reluctant to do so. When, ultimately, they are found to be intractable, they are discharged from the Institute.

OBSERVANCE OF RULES.

Number of patients inspected,.....537	New cases,	Who observed rules well,.....	125	} 262
		Who observed rules fairly well,	96	
		Who did not observe rules, ..	17	
		Of whose observance of rules		
		no record was made,.....	24	
	Old cases,.....	Who observed rules well,	125	} 275
		Who observed rules fairly well,	92	
		Who did not observe rules, ..	23	
		Of whose observance of rules		
		no record was made,.....	35	

During the year a system of inspection has been established under which all patients treated in the dispensary are brought under control as far as possible. The inspection is made by the nurses. All patients were not inspected during the year, but this will be done when the machinery for it has been established. Of the patients inspected, the majority have made a conscientious effort to live up to the rules laid down by the Institute. A copy of the rules is hung in each house in a conspicuous place, and the visiting nurse explains the rules to the patient and inmates of the house. Usually the people are quite willing to coöperate. By kind sympathetic endeavor even the ignorant and careless can be brought under control.

WEIGHT.

New cases,	Number of patients treated,		885	{	Weighted,	836
					Not weighed,	49
	Number of patients treated in dispensary,	Dispensary only, 690	763	{	Weighted,	721
		Dispensary and hospital, 73			Not weighed,	42
	Number of patients treated in hospital,	Hospital only, .. 122	195	{	Weighted,	151
		Hospital and dispensary, .. 73			Not weighed,	44
Old cases,	Number of patients weighed in dispensary,	Gained,	359	{	Total gain,	1858.75 lbs.
		Average gain,			Average gain,	5.17 lbs.
		Lost,	162		Total loss,	664.5 lbs.
	Number of patients weighed in hospital,	No change recorded,	200	{	Average loss,	4.1 lbs.
		Gained,	76		Total gain,	582.3 lbs.
		Average gain,			Average gain,	7.66 lbs.
	Number of patients weighed in hospital,	Lost,	62	{	Total loss,	234.5 lbs.
		No change recorded,	13		Average loss,	3.7 lbs.
	Number of patients treated,		477	{	Weighted,	436
					Not weighed,	41
Old cases,	Number of patients treated in dispensary,	Dispensary only, 382	424	{	Weighted,	381
		Dispensary and hospital, 42			Not weighed,	43
	Number of patients treated in hospital,	Hospital only, .. 53	95	{	Weighted,	71
		Hospital and dispensary, .. 42			Not weighed,	24
	Number of patients weighed in dispensary,	Gained,	124	{	Total gain,	810.88 lbs.
		Average gain,			Average gain,	6.54 lbs.
		Lost,	203		Total loss,	1293.59 lbs.
	Number of patients weighed in hospital,	No change recorded,	54	{	Average loss,	6.34 lbs.
		Gained,	34		Total gain,	327.0 lbs.
		Average gain,			Average gain,	9.6 lbs.
	Number of patients weighed in hospital,	Lost,	30	{	Total loss,	240.75 lbs.
		No change recorded,	7		Average loss,	8.0 lbs.

One of the most striking symptoms of tuberculosis is emaciation. Frequently the only symptom of dormant tuberculosis is subnormal weight. In the treatment of tuberculosis, therefore, gain and loss of weight are fair indices of success or failure. When a patient improves in health, he gains weight, and when he deteriorates in health, he loses weight. This is practically always

true in tuberculosis until the patient has reached a normal weight for his height. After a patient has reached a normal weight, and particularly when he has reached a supernormal weight, the gain or loss of weight is no longer so significant.

The table here given in a measure presents a picture of the success and failure of treatment in the Institute, but does not exactly present a correct picture. Sometimes patients who have been fattened up at the White Haven Sanatorium come to the Institute for treatment, when they have begun to lose weight from want of proper food, and they continue to lose weight even with the assistance which can be given from the Institute. In a general way, however, the gains and losses indicate what has been accomplished in the way of restoring people to health or of preventing the progress of the disease.

It will be seen by the table that the gains are better during the early part of treatment than during the latter part. The old patients who came back for instance, do not show as good a gain as the new patients. For those cases which had been treated during the first year and which were again treated during the second year the losses are nearly as great as the gains, except when the patient came into the hospital. The old patients treated in the hospital during the second year show a fair gain.

This contrast between the first year's patients who were treated in the dispensary during the second year and those who were treated in the hospital during the second year is not to be wondered at when one considers the circumstances of the patients who come to the Phipps Institute for treatment. These patients are all very poor, and, being poor, a long siege of illness such as tuberculosis is a serious matter even when aid is given. Unless recovery takes place in a relatively short time distress, worry, and hardships of all kinds become potent factors for destruction. The vicissitudes of life accumulate, and the burden finally becomes so great that the victim is bound to go under. When patients of this kind are taken into the hospital they are

relieved of many of their burdens, and, therefore, do much better than when treated in their homes.

No summary of weights for two years is given, on account of the difficulty of eliminating error from the records of those cases which have been treated during both years, and are reported on twice. At a future time we may give such a summary.

RESULTS OF TREATMENT.

New cases,	Number of cases disease arrested,	{ Hospital, 0 Dispensary, 9 }	9	} 885
	Number of cases improved,	{ Hospital, 69 Dispensary, 242 }	311	
	Number of cases unimproved,	{ Hospital, 60 Dispensary, 175 }	235	
	Number of cases results not recorded,	{ Hospital, 11 Dispensary, 239 }	250	
	Number of cases terminated in death,	{ Hospital, 55 Dispensary, 25 }	80	
Old cases,	Number of cases disease arrested,	{ Hospital, 1 Dispensary, 10 }	11	} 477
	Number of cases improved,	{ Hospital, 26 Dispensary, 115 }	141	
	Number of cases unimproved,	{ Hospital, 23 Dispensary, 113 }	136	
	Number of cases not recorded,	{ Hospital, 11 Dispensary, 106 }	117	
	Number of cases terminated in death,	{ Hospital, 34 Dispensary, 38 }	72	
Summary for two years without re-consideration of old cases treated during the second year,	Number of cases disease arrested,	{ Hospital, 0 Dispensary, 9 }	9	} 2344
	Number of cases improved,	{ Hospital, 139 Dispensary, 671 }	810	
	Number of cases unimproved,	{ Hospital, 169 Dispensary, 599 }	768	
	Number of cases results not recorded,	{ Hospital, 16 Dispensary, 512 }	528	
	Number of cases terminated in death,	{ Hospital, 116 Dispensary, 113 }	229	

Tuberculosis is quite amenable to treatment. Nearly all cases can be benefited for a time, at least, and many can be cured. The curability of the disease depends upon the stage, and somewhat on the chronicity. Even advanced cases, however, often can be benefited.

The cases which are recorded in the table as having been treated in the hospital were, with few exceptions, advanced cases. Most of them were taken into the hospital because they were reported to the Institute as dying cases. Nearly one-half of those admitted were discharged as improved, and one case was discharged as having had the disease arrested. Less than one-third of those admitted died.

It is indeed remarkable how much even the most advanced cases improve for a time when put at rest in the open air and properly fed. Death in tuberculosis really usually is brought on by an intercurrent disease, such as cold, influenza, or pneumonia.

The patients treated in the dispensary were, as a rule, less advanced than those treated in the hospital, although many of them also were far advanced. The results obtained in the dispensary, however, are very little better than those obtained in the hospital, even with the difference in the cases. This is on account of the difficulty of bringing dispensary patients under control.

On account of home conditions and great poverty it is next to impossible to maintain discipline with such patients in their homes. They often will not sit out in the open air because they have no convenient place to sit in. They will work when they ought to be at rest, because they have some one depending on them. They will not take the diet. Even when supplied with milk, they will divide it up with other members of the family rather than use it for their own recovery. This is particularly true where there are small children in the family. Those patients who take the treatment faithfully and strive to get well usually do well. Many of them recover good physical health and some, in time, get perfectly well.

RETURN PATIENTS.

Number of patients treated this year, 477 .	Who had been treat- ed in the hospital the year before,...	62	Improved the year before,...	156	477	Had received assistance the year before,...	378	477
	Who had been treat- ed in the dispensary the year before,...	423	Not improv- ed the year before,...	119		Had not re- ceived as- sistance the year before,...	60	
	Who had been treat- ed in both the hos- pital and the dis- pensary the year before,...	8	No result re- corded the year be- fore,.....	202		No record of assistance the year before,...	39	

Out of two thousand and forty patients to whom cards of admission had been given during the first year, four hundred and ninety-four came for treatment during the second year. Of these four hundred and seventy-seven were poor tuberculous people. Of course, quite a number of them were under treatment at the end of the first year and simply held over. Some, however, had been discharged much improved and others not improved. The majority of those who came back had received assistance during the previous year.

Much of the story of the tuberculosis work among the poor can be read out of this table. Restoration to health and preservation of health depend upon assistance. To restore these poor people to health without material aid is out of the question. To keep them well without material aid after they have been restored to health is almost equally hopeless. Occasionally one gets well who can stand alone and maintain his health through his own resources. Most of them, however, go under unless assisted.

What, then, is the good of all the work that is done? The good comes from the prevention which is brought about. Treat-

ment of these poor people and prolongation of life give opportunity to teach those who have the disease and those about them methods of prevention. All who have not yet had an implantation can be protected against implantation; many of those who have had implantation and in whom the disease is not yet far advanced can be saved from the full development of the disease; of those who have the disease in a fully developed stage, most will have to die. The fruit of the labor is in the saving of those who are still in health. That this can be accomplished permits of no doubt. Reduction in the death-rate from tuberculosis in all places where preventive measures have been practised firmly establishes this fact. Reduction in the future will even be more rapid than in the past. The benefit of the work is cumulative. With every abatement of a source of infection the opportunity for new implantations grows less. Every year there are fewer foci to look after, and facilities for the control of existing foci become better.

LAWRENCE F. FLICK.

AUTOPSY REPORT.

The autopsies during the second year of the work of the Institute were performed by Dr. Joseph Walsh and Dr. Randle C. Rosenberger, the latter holding the official position of pathologist to the Institute for part of the year.

The accompanying tabulated findings of the autopsies were gleaned from the autopsy records alone, and not from the autopsy records and the microscopic findings. The work of tabulating these findings has fallen to one unacquainted with the cases, and as each pathologist has more or less terms of his own to describe the pathological findings at the autopsy table, this work has not been an easy one. For these reasons some unavoidable errors may have crept into the report.

In cases where several terms have been used to designate the same pathological conditions and the descriptions of these conditions have been clear, the various terms used have been grouped under one head. In other cases this has not been possible. In these latter cases the exact wording of the records has been tabulated. The great number of "not recorded" cases probably represents negative findings of an organ, a normal condition, or a condition which has not been sufficiently abnormal or noteworthy to demand emphasis.

The present pathologist, who makes this report, is not responsible for the terms used or the pathological findings in the cases.

It has been his task solely to tabulate the results found in the autopsy record, and for this he is responsible. He has endeavored to interpret the records made by the former pathologists and to harmonize them, and if any errors have occurred they have been of a trivial character which do not affect the general findings.

The autopsies for the first two years have not been recorded in a way which facilitates detailed statistical work, as general autopsies usually are not so recorded. The work of the third year, however, has been so planned that the autopsy findings will harmonize with the chartings of the clinician, and we hope will show more uniform results when statistically arranged.

During the first year of the Institute, certain organs were assigned to members of the Staff for detailed examination and study. Some of the results of this work are to be found elsewhere in this volume.

Dr. D. J. McCarthy has held in reserve all the nervous tissue, and the results of his examinations are incorporated in a separate report. The study of the nervous tissue has been from the standpoint of the clinician as well as of the pathologist, and represents an important piece of work.

Dr. Joseph Walsh makes a separate report of the gross pathological lesions and the microscopic findings in the kidneys—a valuable piece of work, as it represents the results of an enormous number of histological examinations systematically made and tabulated. It not only shows the findings of isolated and grouped miliary tubercles of the kidneys in these advanced cases of pulmonary tuberculosis, but also the secondary pathological processes that are always constant in the kidney structure of such a long-standing infectious disease.

Dr. Josephus T. Ullom has made similar studies of the liver in a number of cases, and although his work is not so extensive as that upon the kidneys, it has been thorough and shows equally valuable results.

WEIGHT OF ORGANS AS COMPARED WITH BODY WEIGHT, SEX AND AGE.

CASE NUMBER.	LEFT LUNG.	RIGHT LUNG.	LIVER.	SPLEEN.	RIGHT KIDNEY.	LEFT KIDNEY.	HEART.	BODY WEIGHT.	SEX.	AGE.
	GRAMS.*	GRAMS.	GRAMS.	GRAMS.	GRAMS.	GRAMS.	GRAMS.	POUNDS.		
142	...	...	...	...	...	248	...	...	Male	47
172	...	...	...	202	202	217	...	...	Male	49
232	558	...	1676	248	155	217	257	128½	Male	28
236	372	...	1829	186	...	233	248	108½	Male	32
282	899	930	2976	279	233	...	217	115	Male	45
313	...	...	...	...	...	225	321	137	Male	37
462	...	...	1891	248	...	124	...	...	Female	29
501	...	...	1488	142	210	124	...	...	Male	53
531	806	1085	1674	124	124	155	217	101½	Female	19
551	496	589	1674	124	124	140	326	90	Male	28
560	837	1116	1674	217	174	140	322	99½	Male	27
714	620	961	1426	155	124	...	271	...	Female	35
734	...	...	...	...	...	186	248	98½	Male	47
795	1054	1116	1674	186	155	186	171	*90	Female	32
945	372	527	1178	186	202	140	257	91	Male	27
1032	682	930	1178	155	155	...	264	75	Female	34
1157	651	...	1426	109	140	...	...	...	Male	42
1170	No records.	...	...	...	...	...	...	...	Male	...
1279	Not autopsied	...	...	...	...	...	...	...	Male	...
1334	...	...	1054	...	...	...	...	...	Male	50
1344	...	...	...	155	93	93	155	*81½	Female	21
1402	...	...	2132	303	272	...	...	140	Male	32
1411	1116	1147	...	171	155	310	248	101	Male	36
1433	...	...	1302	...	...	124	...	...	Male	26
1490	...	...	...	...	...	...	...	*118½	Male	38
1568	...	...	1736	248	...	...	248	119	Male	44
1577	651	837	3124	419	217	...	264	88	Female	27
1659	...	...	1488	146	...	171	225	92½	Female	33
1756	...	...	1674	194	...	124	233	...	Male	17
1859	...	...	1860	140	148	155	217	102	Female	23

* Grams have been translated from ounces by multiplying by 31.

AUTOPSY REPORT.

53

1806	...	1300	109	155	140	233	...	Female	33
1988	...	...	162	117	148	163	...	Male	16
1994	...	...	...	...	132	...	...	Male	37
1998	...	...	...	...	...	...	90½	Male	29
2046	607	2232	186	194	234	310	142½	Male	31
2102	1116	2573	388	124	155	202	...	Male	18
2104	...	...	...	...	...	...	...	Male	32
2119	...	1420	202	...	...	...	104½	Male	33
2138	No records.	...	...	...	...	...	...	Female	25
2149	No records.	...	...	...	...	...	102	Male	42
2180	620	1926	186	124	155	248	*75½	Female	42
2181	1116	1674	310	155	186	248	100	Male	22
2213	651	1581	124	155	202	186	90½	Male	18
2226	...	1200	109	...	...	155	...	Male	31
2238	...	1829	155	186	121	217	109½	Male	25
2244	1023	...	93	...	...	147	...	Female	26
2252	1039	1860	217	186	248	460	*103½	Male	20
2262	...	1178	155	162	155	140	*79	Male	37
2271	...	1984	124	186	186	217	91	Male	28
2289	651	2480	154	140	171	171	*76½	Male	14
2295	1488	1984	310	186	235	357	...	Male	33
2311	713	1984	310	186	186	310	...	Male	24
2324	No records.	...	...	...	...	...	78½	Male	45
2344	992	1519	217	155	124	248	91½	Female	35
2347	620	1984	295	186	...	290	114	Male	39
2356	899	1488	155	217	...	202	*91½	Male	35
2360	775	1084	186	155	247	264	76½	Female	33
2416	744	1457	202	116	171	271	95½	Male	40
2444	800	2108	217	217	155	310	81	Female	32
2446	620	1209	93	108	202	186	72½	Female	17
2468	527	992	155	109	124	155	...	Female	35
2477	899	1674	155	171	109	207	78½	Female	22

* Not taken within a month.

The body weight given in this table is the last body weight recorded during life and not the body weight after death. For the purpose of estimating the deviation of the organs from the normal weight, however, it answers all practical purposes, as the weight in all cases where recorded, unless otherwise indicated, has been taken within a month before death.

HENRY PHIPPS INSTITUTE.

WEIGHT OF ORGANS AS COMPARED WITH BODY WEIGHT, SEX AND AGE.—(Continued.)

CASE NUMBER.	LEFT LUNG.	RIGHT LUNG.	LIVER.	SPLEEN.	RIGHT KIDNEY.	LEFT KIDNEY.	HEART.	BODY WEIGHT.	SEX.	AGE.
	GRAMS.	GRAMS.	GRAMS.	GRAMS.	GRAMS.	GRAMS.	GRAMS.	POUNDS.		
2490	1364	1116	1866	171	186	171	372	119	Male	52
2494	372	558	1705	124	155	186	171	100½	Male	23
2538	620	930	1620	248	155	155	279	68½	Female	37
2553	806	620	1680	186	186	186	310	118	Male	46
2564	744	837	1085	93	124	155	233	93	Male	36
2576	620	622	1367	144	124	140	186	77	Male	21
2582	310	465	930	171	78	78	109	28	Male	6
2596	930	1500	1488	186	170	186	279	109½	Male	42
2602	372	620	1333	155	...	...	217	*67½	Female	28
2657	744	976	1271	155	108	154	186	81	Male	16
2662	775	837	2016	...	155	217	279	103½	Female	40
2664	...	...	...	682	186	...	...	110½	Male	22
2668	961	1178	1865	93	...	186	248	...	Female	28
2689	744	1820	2480	345	186	186	310	114½	Male	33
2701	430	1209	1302	124	155	186	186	116	Male	22
2716	558	682	1860	248	...	...	248	88½	Male	38
2768	961	488	1674	124	186	186	357	*117½	Female	33
2787	496	567	1488	124	93	124	217	...	Female	35
2796	1147	1302	1820	155	140	140	248	95½	Male	18
2800	...	...	1850	165	...	265	350	103½	Male	44
2815	982	1054	2108	217	186	186	248	...	Female	28
2821	1116	1515	2166	326	233	264	403	136½	Male	34
2855	...	...	...	...	...	...	...	100½	Male	29
2856	992	651	1763	109	...	...	186	70½	Female	48
2899	744	1116	2208	372	202	202	310	...	Male	26
2926	No records.	...	...	...	...	...	...	...	Female	19
2989	...	...	1466	171	248	233	403	...	Male	47
3010	...	...	2219	100	211	233	...	...	Male	37

* Not taken within a month.

AUTOPSIES.

The number of cases autopsied during the second year was eighty-eight. This was out of eighty-nine deaths in the Institute. The patients were all in the advanced stage of pulmonary tuberculosis when admitted into the wards, which accounts for the enormous extension of the tuberculous process within the lungs and the advanced secondary involvement of the various organs either with a tuberculous process or with secondary changes brought about by the disease.

The total number of autopsies for the two years is one hundred and forty-three. A summary for the two years will be given in the tables as far as practicable. But few comments will be made on the totals for the two years, however, as the commentator neither did the autopsies nor prepared the tables for the first year.

EMACIATION.

Emaciation was recorded as,..	None,.....	14	} Out of 88 cases.
	Some,.....	31	
	Marked,.....	40	
	Extreme,.....	3	

SUMMARY FOR TWO YEARS.

Emaciation was recorded as,..	None,.....	20	} Out of 143 cases.
	Some,.....	52	
	Marked,.....	56	
	Extreme,.....	12	

SUBCUTANEOUS FAT.

Subcutaneous fat was recorded as,	Normal,.....	9	} Out of 88 cases.
	Increased,.....	1	
	Abundant,.....	10	
	Diminished,.....	53	
	Absent,.....	7	

SUMMARY FOR TWO YEARS.

Subcutaneous fat was recorded as,	Normal,.....	15	} Out of 143 cases.
	Increased,.....	1	
	Abundant,.....	10	
	Diminished,.....	69	
	Absent,.....	37	

Emaciation more or less marked is usually considered a prominent symptom of advanced pulmonary tuberculosis. It was noted present in a slight degree in 35.2% of the cases, in a marked degree in 45.46 %, in an extreme degree in only 3.4 % and no emaciation was noted in 15.8 %. Only those cases remaining in the wards for a short time showed, as a rule, the most marked emaciation. This in part is explained by the fact that the hospital draws its cases from the poorer classes, and especially from those whose home surroundings are poorest and who constitute foci of contagion which will most likely be removed by their removal to the hospital. Such cases are much emaciated when entering the hospital, and those dying soon after their arrival, have not sufficient time to gain in weight.

This fact alone does not fully explain all of the emaciation in these cases. Tuberculosis is a long-standing disease, accompanied by secondary infections and derangements of the normal functions of the various organs. The chronic phthisical case is not only subject to the drain of a long illness, but is also prone to various secondary infections. These, together with probable faulty metabolic processes the result of the absorption of toxic material, help to explain, in part at least, the varying degrees of emaciation found at the autopsy.

In connection with the degree of emaciation the amount of subcutaneous fat becomes of interest, and especially that over the abdomen, and to a less extent that over the thorax. A body on the autopsy table may show what appears to be marked emaciation; yet on closer examination the subcutaneous fat over the abdomen may show only a very slight, if any, decrease. In some cases of marked emaciation this localized fatty tissue over the abdomen seems to be slightly increased. In eighty cases in which a record was made of the subcutaneous fatty tissue, 13.7 % were recorded as having it increased; 11.3 % as having it about normal; 66.3 % as diminished; and 8.7 % as absent.

BEDSORES.

Number of cases with bedsores,..... 7

SUMMARY FOR TWO YEARS.

Number of cases with bedsores,..... 13

Bedsore were noted in only seven cases, a much better showing than in the previous year, and a remarkably low number of cases (8 % of the cases recorded) for such a long-standing disease. These good results are undoubtedly due, in the first place, to patient and faithful nursing, and, secondly, to the fact that marked emaciation was present in only 3.4 % of the cases.

PERICARDIUM.

Number of cases autopsied, 88	Condition was recorded as,....	Normal,..... 64 Local adhesions, .. 2 General adhesions, .. 2 Obliterated,..... 3 Thickened, 1 Milk spots, 14 Gelatinous degeneration of epicardial fat, 4 Miliary tubercles, .. 1 Acute inflammation,..... 1	Out of 88 cases.
	Fluid was recorded as,....	Normal,..... 24 Excessive, 17	

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143	Condition was recorded as,....	Normal,..... 86 Local adhesions, .. 3 General adhesions, .. 2 Obliterated,..... 8 Thickened, 1 Milk spots, 28 Gelatinous degeneration of epicardial fat,..... 15 Miliary tubercles, .. 3 Acute inflammation,..... 1	Out of 143 cases.
	Fluid was recorded as,....	Normal,..... 24 Excessive, 28	

Tuberculosis of the pericardium in advanced cases of pulmonary tuberculosis is an infrequent condition. This fact is borne out by the results of the autopsies of the first and second years. Only one case out of eighty-eight autopsies of the past year showed typical miliary tubercles and only three out of one hundred and forty-three autopsies for the two years. Eight other cases showed disease of the pericardium; of these, two showed local adhesions; two general adhesions; one thickened pericardium; and three total obliteration of the pericardium.

The fibrous or adhesive cases may or may not have been of tuberculous origin. They probably either were of tuberculous origin or were due to extensions of a fibrous process from the pleura. The case of miliary tubercles of the pericardium for the current year was one of general miliary tuberculosis with wide-spread tubercles in all organs.

Total obliteration of the pericardium was noted in 3.4 % of the cases recorded. This is of interest in comparison with 4.5 % of cases that showed oblitative pleurisy of both pleuræ, or of 19.5 % that showed oblitative pleurisy of the left side and 17 % of the right side. Eighteen and three-tenths per cent. of the cases showed obliteration of the pleura of one or the other side.

Of the cases of obliterated pericardium, one showed obliterated pericardium with right-sided obliterated pleura, none with left-sided obliterated pleura, one with obliterated pleura on both sides, and one without obliterated pleura on either side. The origin of these adhesions, whether of tuberculous nature or some other, if such could be determined from a pathological examination, would be a matter of mere conjecture in these cases, as no histological examinations were made.

The amount of fluid in the pericardial sac was noted as normal in twenty-four cases and excessive in seventeen. Of the seventeen cases in which the fluid was excessive, the larger amounts were: 150 c.c., 150 c.c., 175 c.c., 200 c.c., 100 c.c., 100

c.c., 100 c.c., 100 c.c., 100 c.c. These amounts simply represent an excess of the normal clear yellowish fluid.

The table on the pericardium here given, as also the table on the heart following, should be studied in connection with Dr. George W. Norris' report on the cardiac condition in tuberculous cases, published as part of this report, and the table on diseases of the circulatory system given in the report on the work of the year. A comparison of these tables with the table on the disturbances of the sympathetic nervous system will also be of interest.

HEART.

Number of cases autopsied, 88.	Size was recorded as, ..	{ Normal, .....32 } { Decreased, .....12 } { Increased, .....26 }	Out of 88 cases.
	Color of muscles was recorded as,	{ Pale, .....28 } { Dark, .....1 } { Normal, .....14 }	Out of 88 cases.
	Consistency of muscles was recorded as,....	{ Firm, .....10 } { Soft, .....11 } { Fatty, .....6 } { Gelatinous fatty, .....4 }	Out of 88 cases.
	Condition of muscles was recorded as,....	{ Hypertrophy of both ventricles, .....1 } { Hypertrophy of left ventricle, .....3 } { Hypertrophy of right ventricle, .....2 } { Dilatation of both ventricles, .....2 } { Dilatation of right ventricle, .....10 } { Dilatation of left ventricle, .....1 } { Dilatation and hypertrophy, .....1 }	Out of 88 cases.
	Valves were recorded as,	{ Normal, .....52 } { Mitral thickened, .....8 } { Mitral atheromatous with endocarditis, .....1 } { Mitral and aortic thickened, .....3 } { Aortic dilated, .....2 } { Aortic constricted, .....2 } { Aortic atheromatous, .....2 } { Aortic vegetations, .....1 }	Out of 88 cases.

HEART.—(*Continued.*)

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143.	Size was recorded as, ..	{ Normal, 53 { Decreased, 13 { Increased, 26	Out of 143 cases.
	Color of muscles was recorded as,	{ Pale, 28 { Dark, 1 { Normal, 14	Out of 143 cases.
	Consistency of muscles was recorded as,	{ Firm, 10 { Soft, 11 { Fatty, 6 { Gelatinous fatty, 4	Out of 143 cases.
	Condition of muscles was recorded as,	{ Hypertrophy of both ventricles, 2 { Hypertrophy of left ventricle, 6 { Hypertrophy of right ventricle, 2 { Dilatation of both ventricles, 6 { Dilatation of right ventricle, 19 { Dilatation of left ventricle, 1 { Dilatation and hypertrophy, 1	Out of 143 cases.
	Valves were recorded as,	{ Normal, 52 { Mitral thickened, 8 { Mitral sclerosed, 5 { Mitral atheromatous with endocarditis, 3 { Mitral and aortic thickened, 3 { Aortic dilated, 2 { Aortic constricted, 2 { Aortic sclerosed, 7 { Aortic atheromatous, 2 { Aortic vegetations, 2	Out of 143 cases.

The much-discussed question whether lesions of the heart are antagonistic to pulmonary tuberculosis presents itself for further thought from the records of the year. Of the eighty-six cases in which the condition of the heart was noted, twenty-one, or 23.9 %, were normal. The valvular lesions of the heart are of especial interest in this connection, and of the remaining cases, the mitral valve was diseased in eight cases; the mitral valve and aortic valve in six cases, and the aortic valve in nine cases.

No organic lesions of the pulmonary or tricuspid valve were

noted. It is a fact, however, that in advanced pulmonary tuberculosis passive congestions of the organs are common findings at the autopsy table. These are the result of weak heart action and probable relative insufficiencies of some of the valves, and especially those of the right side of the heart. According to the tables here given, 26.1 % of the cases showed changes in the valve-leaflets. The other changes in the heart were of a muscular nature.

Whether these lesions precede or accompany the tuberculous process, it is impossible at this time to state. The facts, however, are of interest, and the changes in the heart-valves in this series of autopsies show a higher percentage of disease than was at one time supposed. However, actual organic constrictions or dilatations or vegetations of the valves are noted in only 4.5 % of the cases.

Tuberculous lesions of the heart-muscle or of the valve are comparatively rare. No lesion ascribed to the tubercle bacillus in the eighty-eight cases brought to autopsy was noted.

The findings at the autopsy table in relation to the size of the heart in comparison with the general size and construction of the body are of especial interest. This comparison was noted in only seventy cases. Of these, the heart was recorded normal in size in thirty-two cases, increased in size in twenty-six cases, and decreased in size in only twelve.

These records in regard to the size of the heart depend solely upon the examiner's opinion, being deduced from a general consideration of the body as a whole, and are, therefore, subject to criticism, however carefully made. It has been stated that a small heart is the rule in tuberculous patients. Such, however, has not been proved by the results of the year's records.

The summary for two years supports the deductions drawn from the statistics for the year. Unfortunately, the first year's record is even less complete than the second year's; but even so, the conclusions are borne out.

BLOOD-VESSELS.

Number of autopsies, 88,.....	{	The aorta was recorded as,..	{	Normal,.....	39	} Out of 88 cases.
			{	Atheromatous,	29	
		The tibial artery was recorded as,		Atheromatous,	1	..Out of 88 cases.
		The coronary artery was recorded as,.....		Calcified,.....	1	..Out of 88 cases.
		The jugular vein was recorded as,		Dilated,.....	1	..Out of 88 cases.

Atheroma, especially of the aorta and some of its larger branches, was noted in twenty-nine of seventy cases recorded, the remaining forty-one cases showing a normal condition. In the majority of these cases the atheromatous patches consisted of small yellowish areas at the beginning of the aorta, and were designated in the autopsy reports as "beginning" atheroma.

PLEURA.

Number of cases autopsied, 88	Normal,		{ Left,		2	} Out of 88 cases.
			{ Right,		1	
	Adhesions were recorded as,.	Apex,....	Left, .	Recent,.....	6	
				Dense,.....	11	
			Right,	Recent and dense,.	4	
				Not tabulated as to recency and density,.....	13	
		Rest of upper lobe, ..	Left, .	Recent,.....	0	
				Dense,.....	6	
			Right,	Recent and dense,.	2	
				Not tabulated as to recency and density,.....	12	
			Left, .	Recent,.....	7	
				Dense,.....	11	
			Right,	Recent and dense,.	0	
				Not tabulated as to recency and density,.....	0	
			Left, .	Recent,.....	3	
				Dense,.....	4	
			Right,	Recent and dense,.	1	
				Not tabulated as to recency and density,.....	0	

AUTOPSY REPORT.

63

Number of cases autop- sied, 88	Adhesions were recorded as, .	Middle lobe, ..	Right,	Recent,.....	2	Out of 88 cases.
				Dense,.....	1	
				Not tabulated as to recency and den- sity,.....	10	
		Lower lobe, ..	Left, .	Recent,.....	7	
				Dense,.....	5	
				Not tabulated as to recency and den- sity,.....	0	
			Right,	Recent,.....	2	
				Dense,.....	2	
				Not tabulated as to recency and den- sity,.....	5	
		General, .	Left, .	Recent,.....	4	
				Dense,.....	8	
				Recent and dense, .	4	
			Right,	Not tabulated as to recency and den- sity,	13	
				Recent,.....	3	
				Dense,.....	7	
		Oblitera- ting,...	Left,	Recent and dense, .	0	
				Not tabulated as to recency and den- sity,.....	9	
			Right,	Recent,.....	17	
				Dense,.....	15	
	Pyothorax was recorded as, .	Left,	Right (100 c.c., 1006 c.c., 500 c.c., 240 c.c., 240 c.c.),.....	Recent,.....	0	
				Dense,.....	5	
	Pyopneumotho- rax was re- corded as,...	Left (124 c.c., 1000 c.c., —),.....	Right (410 c.c., 400 c.c.),	Recent,.....	3	
				Dense,.....	2	
	Pneumothorax was recorded as,	Left,	Right,	Recent,.....	1	
				Dense,.....	4	
	Acute fibrinous pleurisy was recorded as, .	Left,	Right,	Recent,.....	1	
				Dense,.....	0	
	Serous effusion was recorded as,	Left (200 c.c., 176 c.c., 300 c.c., 155 c.c., 500 c.c., 500 c.c., 248 c.c.),.....	Right (1000 c.c., 300 c.c., 1000 c.c., 400 c.c., 300 c.c., 400 c.c., 900 c.c., 300 c.c., 250 c.c.,	Recent,.....	7	
				Dense,.....	9	
	Serous effusion, sacculated, was recorded as,	Left,	Right,	Recent,.....	0	
				Dense,.....	1	
	Calcified was recorded as, .	Left,	Right,	Recent,.....	0	
				Dense,.....	1	

Number of cases autop- sied, 143	Pyothorax was recorded as, ..	{ Left, 3 Right, 6	Out of 143 cases.
	Pyopneumotho- rax was re- corded as, ...	{ Left, 5 Right, 5	
	Pneumothorax was recorded as,	{ Left, 1 Right, 4	
	Serous effusion was recorded as,	{ Left, 8 Right, 14	
	Acute fibrinous pleurisy was recorded as, ..	{ Left, 1 Right, 0	
	Serous effusion, sacculated, was recorded as,	{ Left, 0 Right, 1	
	Calcified was recorded as, ..	{ Left, 0 Right, 1	

The pleurisies as encountered in the autopsies were accompanied by a tuberculous process of the underlying lung tissue, and it is, therefore, plausible to suppose that the conditions found are the result of these underlying lesions. Whether the process in the pleura antedated, went hand in hand with, or was secondary to, the lung lesions is a problem offering a field for profitable investigation, but one difficult to solve in these advanced cases on account of the extensiveness of the process or of its fibroid nature. Absence of disease in one of the pleuræ occurred only three times in the cases autopsied. Twice the left pleura was normal, and once, the right.

The pleurisies as found at the autopsy table were of the fibrous adhesive type, and showed thickening of the visceral layer as well as the parietal layer. The nature of the adhesions in the region of the apex of the lung was noted in the left chest in only twenty-one cases. Of these, six showed recent adhesions, eleven dense adhesions, and four recent and dense adhesions. At the apex of the right lung eight cases only were recorded. Of these there were: recent adhesions, none; dense adhesions, six; and recent and dense adhesions, two.

These cases, therefore, do not represent the condition of the pleura in all cases autopsied, but only in comparatively few of them. Any deduction from these few cases from a standpoint of apical pleurisy in pulmonary tuberculosis would be erroneous.

Obliteration of the pleura was noted on the left side in seventeen cases (19.5 %), and on the right in fifteen cases (17 %); of these cases eight, or 4.5 %, showed an obliterating process present on both sides. This type of pleurisy, namely, fibroid pleurisy, with either local or general adhesions or as an obliterating process, stands out most prominently as a form of pleurisy that accompanies pulmonary tuberculosis. This is of particular interest in contrast with the pleurisies in the lower animals, especially in cattle, where tubercles mostly predominate.

Serous effusions in the pleural cavity were noted seven times in the left chest and nine times in the right. In the former 500 c.c. was the highest amount noted; in the latter, 1000 c.c. On the right side, the average was 540 c.c.; on the left 300 c.c. Pyopneumothorax was noted three times on the left side; on the right side it was noted five times, and in combination with the pneumothorax twice. Simple pneumothorax was present on the left side once, to four times on the right side.

The summary of the conditions of the pleura for two years is of value only in a general way, as it does not give details of the first year's autopsies. Even as it stands, however, it forcibly emphasizes the important rôle which pleurisy plays in tuberculosis. In one hundred and forty-three autopsies there were only ten normal pleuræ, five on each side. In no case were both pleuræ normal. The table gives a graphic picture of the part which the pleura plays in tuberculosis. As yet we are unable to interpret this picture correctly.

That the pleura is one of the battlefields in the great struggle between the invaded organism and the tubercle bacillus cannot be doubted, in view of the damage done. What the nature of the conflict is, and why the pleura is so badly damaged in it, remains for science to work out.

The theories advanced that the pleura is obliterated so that the lung might have rest seem from the general findings rather illogical. The condition in the pleura either is primary in origin or is the result of advancement of the process in the underlying lung, and might be looked upon as a serious loss of an important organ rather than an act of nature to help in the cure.

LUNGS.

Condition was record- ed as,.....			Lungs.		
			Left.	Right.	
		Apex,....	32 cavities, large, ...	35	
			17 cavities, small and single,.....	18	
			14 cavities, small and numerous,.....	0	
			1 healed lesion,....	0	
			0 emphysema,	3	
			Left.	Right.	
			0 normal,	0	
			12 congested,.....	7	
			3 infiltrated,.....	0	
			7 cavities, large, ...	4	
			cavities, small and single,...	7	
			9 cavities, small and numerous, ..	0	
			7 fibroid,.....	13	
			13 miliary tubercles, not tabulated, ..	12	
			9 miliary tubercles, coalesced,.....	3	
			0 miliary tubercles, coalesced and many,.....	6	
			4 miliary tubercles, coalesced and scattered,	1	
			2 not tabulated,....	0	
			3 bronchopneumonia,	3	
			12 caseous pneumonia,	12	
			1 tuberculous pneumonia,	11	
			3 healed lesions, ...	1	
			1 collapsed,.....	1	
			9 edema,.....	7	
			5 bronchiectasis, ...	10	
			0 anthracosis,.....	0	
			0 gangrene,.....	1	
			0 atelectasis,.....	0	
			20 emphysema,	16	

Out of 88
cases.

LUNGS.—(Continued.)

Condition was record- ed as,		Middle lobe and right lower lobe not tab- ulated.	
		Middle lobe.	Middle lobe and right lower lobe not tab- ulated.
Middle lobe; and middle lobe and right lower lobe not tabu- lated,		0 congested,.....	11
		2 infiltration,	0
		5 cavities, large,.....	3
		9 cavities, small and single,.....	5
		0 cavities, small and numerous,..	1
		6 fibroid,.....	3
		5 { miliary tubercles, not tabu- lated,.....	0
		1 miliary tubercles, coalesced,....	4
		9 { miliary tubercles, coalesced and many,	6
		0 { miliary tubercles, coalesced and scattered,.....	4
		0 not tabulated,.....	2
		0 bronchopneumonia,.....	4
		5 caseous pneumonia,.....	5
		2 tuberculous pneumonia,.....	0
		0 healed lesions,	0
		1 collapsed,.....	0
		2 edema,.....	8
		0 bronchiectasis,	2
		0 anthracosis,.....	0
		1 gangrene,.....	0
		5 emphysema,	0
Lower lobe,	Left.	Right.	Out of 88 cases.
	0 normal,.....	0	
	23 congested,.....	2	
	0 infiltrated,.....	0	
	5 cavities, large,.....	7	
	8 cavities, small and single,	13	
	11 cavities, small and numerous, ..	0	
	8 fibroid,.....	6	
	23 { miliary tubercles, not tabu- lated,.....	3	
	4 miliary tubercles, coalesced,....	2	
	4 { miliary tubercles, coalesced and many,	9	
	2 { miliary tubercles, coalesced and scattered,.....	0	
	0 not tabulated,.....	0	
	5 bronchopneumonia,	0	
	5 caseous pneumonia,.....	8	
	2 tuberculous pneumonia,.....	2	
	0 healed lesions,.....	0	
	1 collapsed,.....	1	
	19 edema,.....	3	
	4 bronchiectasis,	3	
	1 anthracosis,.....	0	
	0 gangrene,.....	0	
	0 atelectasis,.....	2	
	17 emphysema,	5	

SUMMARY FOR TWO YEARS.

	<i>Left.</i>	<i>Right.</i>	
Condition of lungs in general was recorded	1 normal,.....	0	} Out of 143 cases.
as,	70 cavities, large,....	81	
	68 cavities, small, ...	59	
	11 cavities, undefined, ..	11	
	19 fibroid,.....	29	
	10 healed lesions, ...	7	

The statistics here given as gathered from the autopsy reports do not represent the detailed state of tuberculous involvement and accompanying conditions, inasmuch as the records are misleading from the fact that conditions were described without sufficient specification regarding the detailed nature of the process. This is especially true of the conditions tabulated as "pneumonias," "infiltration," etc.

From the records of the year reported on, the cavities of the lungs are tabulated into large and small, and, as far as possible, are located in the various lobes. In the left upper lobe thirty-nine large cavities are tabulated; thirty-two are located at the apex and seven are not tabulated as to position. Of the smaller cavities of the left upper lobe, forty were tabulated. Of these, seventeen were single small cavities at the apex; fourteen were multiple small cavities at the apex; and nine were not tabulated as to position or number. In the left lower lobe five cases showed large cavities, eight cases single small cavities, and eleven cases numerous small cavities. These were not designated as predominating in any one part of the lobe.

In the upper lobe of the right lung large cavities were noted in thirty-nine cases; of these, thirty-five cases showed localization in the apex of the lobe and four cases were not tabulated as to position. Of the single smaller cavities, twenty-five were recorded in the upper lobe. Of these, eighteen were recorded in the apex and seven were not tabulated as to position. Numerous small cavities were recorded in nine cases without localization.

In the middle lobe five large cavities and nine small cavities were noted, with no record of numerous small cavities. In the

lower lobe seven cases showed large cavities, thirteen single small cavities, and two numerous small cavities. Emphysema was noted in twenty cases of the upper lobe of the left lung and seventeen cases of the lower lobe. In the right lung it was noted in three cases at the apex; in sixteen cases in the upper lobe; in five cases in the middle lobe, and in five in the lower lobe.

Healed lesions were noted in a remarkably low percentage of cases. In the left lung four healed lesions are recorded, once at the apex and three times not tabulated as to position. In the right lung one case only is recorded as showing a healed lesion. This was found at the apex of the upper lobe. The healed lesions in these cases were diagnosed from the macroscopic appearance only.

The summary of the lung conditions is given on a very limited number of topics only. The first year's report is too incomplete in the details to enable us to do more. What we do give, however, presents a very good picture of the ravages which tuberculosis works in the lungs before death ensues. In one hundred and forty-three autopsies only one normal lung was found.

SPLEEN.

Number of autopsies, 88,	Size was recorded as,	Normal,	22	} Out of 88 cases.
		Enlarged,	37	
		Small,	15	
	Consistency was recorded as, ..	Normal,	22	} Out of 88 cases.
		Hard,	8	
		Soft,	27	
		Firm,	29	
	Color was re- corded as,	Normal,	40	} Out of 88 cases.
		Dark,	30	
		Pale,	5	
	Condition was re- corded as,	Normal,	22	} Out of 88 cases.
		Perisplenitis,	3	
		Congested,	3	
		Pigmented,	1	
		Miliary tubercles, ..	6	
		Amyloid,	8	
		Supernumerary (1),	8	
		Supernumerary (2),	3	
		Supernumerary (3),	1	
		Infarct,	1	

SUMMARY FOR TWO YEARS.

Number of autopsies, 143,	Size was recorded as,	Normal,.....	50	} Out of 143 cases.
		Enlarged,.....	45	
		Small,.....	23	
	Consistency was recorded as,...	Normal,.....	50	} Out of 143 cases.
		Hard,.....	16	
		Soft,.....	35	
		Firm,.....	29	
	Color was re- corded as,....	Normal,.....	68	} Out of 143 cases.
		Dark,.....	30	
		Pale,.....	5	
	Condition was re- corded as,....	Normal,.....	50	} Out of 143 cases.
		Perisplenitis,.....	11	
		Congested,.....	3	
		Pigmented,.....	1	
		Miliary tubercles,..	6	
		Amyloid,.....	8	
		Scars on the sur- face,.....	2	
		Supernumerary (1),	8	
		Supernumerary (2),	3	
		Supernumerary (3),	1	
		Infarct,.....	1	

The spleen in cases of pulmonary tuberculosis shows, as a rule, one of three chief conditions or a combination of them:

1. Tubercles. These result from the lodgment of the tubercle bacillus, which has gained entrance to the organ by way of the blood-stream into the tissues, and the resulting lesion is of the miliary type. At autopsy the number of miliary tubercles in the spleen varies with the degree of infection, and the size of the tubercles with the chronicity of the lesion.

2. Secondary changes. These are probably the result of mixed infections through absorption of micro-organisms or their products from tuberculous cavities or of secondary infections, such as influenza, pneumonia, appendicitis, etc. Many cases show evidence of an acute infection.

3. Amyloid degeneration. This is a varying finding in cases of tuberculosis. In eighty-eight cases one showed amyloid degeneration of the sago type, while eight others were not tabulated as to type.

LIVER.

Number of cases autopsied, 88,.....	{	Size was recorded as,	{	Normal,..... 27	} Out of 88 cases.
			{	Large,..... 34	
				Small,..... 14	
	{	Color was recorded as,....	{	Normal,..... 12	} Out of 88 cases.
			{	Dark,..... 24	
				Pale,..... 30	
				Mottled,..... 7	
	{	Consistency was recorded as, ..	{	Normal,..... 20	} Out of 88 cases.
			{	Firm,..... 44	
				Soft,..... 10	
	{	Condition was recorded as,....	{	Normal,..... 9	} Out of 88 cases.
				Atrophy,..... 1	
				Red atrophy,..... 1	
				Cirrhosis,..... 1	
				Fatty,..... 18	
				Passive congestion, .. 8	
				Amyloid,..... 4	
				Tubercles, a few, .. 12	
				Coalesced tubercles, 1	

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143,.....	{	Size was recorded as,	{	Normal,..... 60	} Out of 143 cases.
			{	Large,..... 34	
				Small,..... 14	
	{	Color was recorded as,....	{	Normal,..... 12	} Out of 143 cases.
			{	Dark,..... 24	
				Pale,..... 30	
				Mottled,..... 7	
	{	Consistency was recorded as, ..	{	Normal,..... 20	} Out of 143 cases.
			{	Firm,..... 44	
				Soft,..... 10	
	{	Condition was recorded as, ..	{	Normal,..... 42	} Out of 143 cases.
				Atrophy,..... 1	
				Red atrophy,..... 1	
				Cirrhosis,..... 3	
				Fatty,..... 23	
				Passive congestion, 13	
				Amyloid,..... 9	
				Tubercles, a few, .. 14	
				Coalesced tubercles, 1	

From the records, the liver in pulmonary tuberculosis appears to be slightly enlarged, of a firm consistency, and of a pale color. Such were the findings in over one-half of the cases. Amyloid changes were noted in only four cases as against nine in the spleen—a remarkably low number of cases for this change. For the two years there were nine cases. A detailed account of some of the livers will be found in Dr. Ullom's article.

PERITONEUM.

Number of cases autopsied, 88,.....	Condition was recorded as,....	Normal,.....	55	} Out of 88 cases.
		General adhesions,	4	
		Local adhesions, ..	15	
		Tuberculous adhesions,.....	2	
	Fluid was recorded as,.....	Increased,.....	21	} Out of 88 cases.
		Dark,.....	1	
		Cloudy,.....	2	
		Bloody,.....	2	
	Purulent,.....	4		

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143,.....	Condition was recorded as,....	Normal,.....	101	} Out of 143 cases.
		General adhesions,	6	
		Local adhesions, ..	18	
		Tuberculous adhesions,.....	2	
	Fluid was recorded as,.....	Increased,.....	24	} Out of 143 cases.
		Dark,.....	1	
		Cloudy,.....	2	
		Bloody,.....	2	
	Purulent,	4		

Tuberculosis of the peritoneum as a general condition was noted in only four cases. Localized peritonitis from tuberculous ulcers of the intestines was noted in fifteen cases. In three of the cases general peritonitis followed perforation of an ulcer of the intestines. The peritoneal fluid was noted as dark in one; bloody in two; and "cloudy" in four cases. In these latter cases the condition is explained in three by perforation of the intestines from ulceration.

ESOPHAGUS.

Tuberculosis of the esophagus is a very rare condition. In the majority of text-books it is considered only as a secondary condition to tuberculosis elsewhere, such as the pulmonary tissue and upper parts of the respiratory or gastro-intestinal tract. The exemption of the esophagus is probably due to its stratified pavement epithelium which is most resistant to the disease. The esophagus was recorded as normal in fifty-nine cases. In the others there is no record, from which the inference may be drawn that they were normal.

OMENTUM.

Number of cases autopsied, 88,....	{	The amount of fat was recorded as,	{	Normal,.....	54	} Out of 88 cases.
				Excessive,.....	9	
				Diminished,.....	5	
		The condition was recorded as, .....Adhesions				3, ..	Out of 88 cases.

Tubercles of the omentum were not observed. A normal amount of fat was noted in fifty-four cases with an excessive amount in nine cases, and a diminished amount in only five cases. This is probably to be explained by the excessive amount of fatty diet which the patients received while under treatment.

STOMACH.

Number of cases autopsied, 88,.....	{	Size was recorded as,	{	Normal,.....	33	} Out of 88 cases.
				Large,.....	29	
				Small,.....	17	
		Shape was recorded as,....	{	Normal,.....	3	} Out of 88 cases.
				Hour-glass contraction,	7	
		Position was recorded as,.....Gastroptosis,.....	3,..	Out of 88 cases.		

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143,.....	{	Size was recorded as,	{	Normal,.....	33	} Out of 143 cases.
				Large,.....	29	
				Small,.....	17	
		Shape was recorded as,....	{	Normal,.....	3	} Out of 143 cases.
				Hour-glass contraction,	7	
		Position was recorded as, .....Gastroptosis,.....		5, ..	Out of 143 cases.	
		Condition was recorded as,.....Small ulcerations, ..		1, ..	Out of 143 cases.	

The stomach in a large number of cases showed, from the macroscopic examination, a remarkably normal condition. Ulceration was recorded once in one hundred and forty-three cases, and tubercles were not recorded at all. This is not surprising, because tuberculosis of the mucous membrane of the stomach is one of the rarest conditions. Functional disturbances are more in evidence clinically than distinct organic changes are

at the autopsy table. The resisting power of the mucosa of the stomach must be enormous as compared with the resisting power of the mucosa of the intestines, where tubercles and tuberculous ulceration are the rule. The varying degrees of resistance of these two membranes and their secretions offer a field for special investigation.

SMALL INTESTINE.

Number of cases autopsied, 88,.....	Condition was recorded as,....	Normal to external and internal examination,.....	47	} Out of 88 cases.
		Tuberculous ulcers in jejunum,.....	2	
		Tuberculous ulcers in ileum,.....	6	
		Tuberculous ulcers not tabulated,...	17	
		Miliary tubercles in ileum,.....	1	
		Congestion,.....	8	
		Perforation,.....	3	

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143,.....	Condition was recorded as,....	Normal to external examination only,	22	} Out of 143 cases.
		Normal to external and internal examination,.....	57	
		Tuberculous ulcers in jejunum,.....	2	
		Tuberculous ulcers in ileum,	6	
		Tuberculous ulcers not tabulated,...	35	
		Miliary tubercles in ileum,.....	1	
		Miliary tubercles not tabulated,...	1	
		Congestion,.....	8	
		Perforation,.....	3	
		Tenia saginata,...	1	
		Diverticulum,.....	1	

The changes in the small intestine are gathered from a partial examination only, and not from a complete examination of the whole tract. It is, therefore, not at all surprising that ulcers in the mucosa of the small intestine were noted in the jejunum only twice and in the ileum six times. In seventeen other cases ulcerations were not tabulated as to location.

These figures give entirely too small a proportion of cases with lesions to show the usual frequency of a diseased condition. Even incomplete as these statistics are, however, they show that intestinal involvement in the tuberculous process is a serious matter in tuberculosis. The summary for the two years supports the deductions drawn from the statistics of the current year.

The frequency of intestinal involvement raises the question of reinfection by way of the alimentary canal through the swallowing of sputum. The draining lymphatic glands of the intestinal tract—the mesenteric glands—nearly always show enlargement, usually with evidence of caseation. Both the intestinal ulceration and the lymphatic enlargement of the mesentery call attention to the intestinal tract as a possible avenue through which the tubercle bacillus again reinfects the tissues.

APPENDIX.

Number of cases autopsied, 88	Size was recorded as,	Normal,.....	0	Out of 87 cases.
		Small,.....	2	
		Large,.....	2	
Number of cases autopsied, 88	Condition was recorded as,....	Normal to external and internal examination,.....	35	Out of 88 cases.
		Congestion,.....	2	
		Appendicitis,.....	2	
		Adhesions,.....	16	
		Fecal concretions, .	2	
		Tuberculous ulcers, .	31	
		Tubercles,.....	4	

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143...	Size was recorded as,	Normal,.....	0	Out of 143 cases.
		Small,.....	2	
		Large,.....	2	
Number of cases autopsied, 143...	Condition was recorded as,	Normal to external examination only, .	12	Out of 143 cases.
		Normal to external and internal examination,.....	49	
		Congestion,.....	2	
		Appendicitis,.....	2	
		Adhesions,.....	21	
		Fecal concretions, .	2	
		Tuberculous ulcers, .	44	
		Tubercles,.....	4	
		Removed by operation,.....	1	
		Sacculated,	1	

At the autopsy table thirty-five appendices were normal to internal and external examination, and thirty-one showed tuberculous ulceration. The measure was taken in forty, the largest of which was thirteen centimeters and the smallest three centimeters. The finding at autopsy of ulcers in the appendix in thirty-one cases without subjective or objective symptoms having existed clinically, shows the tuberculous process in this organ to hold a very unique position as compared with the ordinary inflammatory conditions of the organ. In many of the cases localized adhesions and small amounts of pus were present. The tuberculous process in the appendix does not, from these cases, produce the symptom-complex found in ordinary appendicitis.

From the type and general picture of the tuberculous process of the appendix the lesions in all likelihood are usually secondary to the pulmonary condition, and not of a primary nature, as suggested by some authors.

The summary for two years shows about the same proportion of tuberculous appendices to normal ones as the table for the current year. Of the one hundred and forty-three patients, only one had had his appendix removed.

LARGE INTESTINE.

Condition was recorded as, ...	Normal,.....	67	} Out of 88 cases.
	Tubercles,.....	3	
	Ulcers not tabulated as to few or		
	many,.....	7	
	Ulcers few,.....	3	
	Ulcers many,.....	2	
	Ulcers small and few,	1	

SUMMARY FOR TWO YEARS.

Condition was recorded as, ...	Normal,.....	67	} Out of 143 cases.
	Tubercles,.....	3	
	Ulcers not tabulated as to few or		
	many,.....	9	
	Ulcers few,.....	3	
	Ulcers many,.....	2	
	Ulcers small and few,	1	

What has been said of tuberculous ulcers in the small intestine is applicable here. The statistics given undoubtedly understate the frequency with which tuberculous disease affects the large intestine.

ISCHIORECTAL REGION.

Condition was recorded as, ...	{	Normal,.....	61	}	Out of 88 cases.
		Having a scar,.....	1		
		Having an abscess,.....	1		
		Having a fistula,.....	2		
		Having hemorrhoids,.....	1		

SUMMARY FOR TWO YEARS.

Condition was recorded as, ...	{	Normal,.....	61	}	Out of 143 cases.
		Having a scar,.....	1		
		Having an abscess,.....	1		
		Having a fistula,.....	5		
		Having hemorrhoids,.....	1		

The statistics here given only record lesions gross enough to attract attention. They cannot be accepted as indicating in any sense the frequency of tuberculosis of the ischiorectal region.

LYMPHATIC GLANDS.

Number of cases autopsied, 88...	Mesenteric,...	Size was recorded as,	{	Normal,.....	9	}	Out of 88 cases.
				Enlarged,.....	58		
		Condition was recorded as,	{	Hemolymph gland,	1	}	Out of 88 cases.
				Not caseous,.....	6		
	Cervical,	Size was recorded as,	{	Normal,.....	33	}	Out of 88 cases.
				Enlarged,.....	33		
		Condition was recorded as,	{	Palpable,.....	3	}	Out of 88 cases.
				Tuberculous,.....	1		
	Bronchial,...	Size was recorded as,	{	Normal,.....	0	}	Out of 88 cases.
				Enlarged,.....	26		
		Condition was recorded as,	{	Calcified,.....	2	}	Out of 88 cases.

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143..	Mesenteric,...	Size was recorded as,	Normal,.....16 Enlarged,.....96	Out of 143 cases.
		Condition was recorded as,	Hemolymph gland, 1 Not caseous,..... 6 Calcified,..... 1	Out of 143 cases.
	Cervical,	Size was recorded as,	Normal,.....33 Enlarged,.....35 Palpable,..... 3	Out of 143 cases.
		Condition was recorded as,	Tuberculous,..... 1	Out of 143 cases.
	Bronchial,...	Size was recorded as,	Normal,..... 0 Enlarged,.....44	Out of 143 cases.
		Condition was recorded as,	Calcified,..... 2	Out of 143 cases.

It must be frankly admitted that the statistics here given are of no scientific value, because of their incompleteness. To determine whether or not any chain of lymphatic glands is normal or abnormal, even from a point of view of gross pathology, requires careful examination of each gland, a labor which is almost prohibitive in an ordinary autopsy. During the formative period of the Institute such exact work was impossible. The statistics, however, have some practical value in that they show what can be discovered upon a superficial examination.

Of the cases recorded, the majority show enlargement, without specifying what caused the enlargement. As a microscopic examination or a definite description of the glands was not made, it is impossible to state whether they were distinctly tuberculous or not. It is reasonable to believe, however, that the majority of them were tuberculous, from the fact that they drained tuberculous foci in their neighborhood.

PANCREAS.

The pancreas was recorded as,.....	Normal,..... 9	Out of 88 cases.
	Enlarged,..... 1	

This organ was noted in ten cases only. In nine cases it was normal; and in one case it showed enlargement. The

cause for the enlargement was not specified. Tuberculosis of the pancreas is a very rare condition, even in cases of miliary tuberculosis.

Two forms have been observed—the miliary form and the solitary tubercles. Extension of a tuberculous process from tuberculous lymphatic glands around the head of the organ has also been observed. The organ seems to have a special immunity against invasion of the tubercle bacillus.

KIDNEYS.

Number of cases autopsied, 88.	Size was recorded as,.	Normal,	<div> <div>Left,.....17</div> <div>Right,.....13</div> </div>	Out of 88 cases.
		Smaller,	<div> <div>Left,.....14</div> <div>Right,.....12</div> </div>	
		Larger,	<div> <div>Left,.....19</div> <div>Right,.....31</div> </div>	
	Shape was recorded as,.	Normal,	<div> <div>Left,.....2</div> <div>Right,.....0</div> </div>	Out of 88 cases.
		Abnormal, ..	<div> <div>Left,.....2</div> <div>Right,.....0</div> </div>	
	Condition was recorded as,.....	Left,	<div> <div>Interstitial nephritis, 4</div> <div>Parenchymatous nephritis,.....36</div> <div>Diffuse nephritis,....4</div> <div>Nephritis not tabulated, .....1</div> <div>Congested,.....19</div> <div>Fatty,.....15</div> <div>Pale,.....23</div> <div>Amyloid,.....3</div> <div>Miliary tubercles,....27</div> <div>Movable,.....1</div> <div>Cysts,.....6</div> <div>Tuberculosis,.....4</div> </div>	Out of 88 cases.
		Right,	<div> <div>Interstitial nephritis, 3</div> <div>Parenchymatous nephritis,.....33</div> <div>Diffuse nephritis,....3</div> <div>Nephritis not tabulated, .....1</div> <div>Congested,.....20</div> <div>Fatty,.....12</div> <div>Pale,.....18</div> <div>Amyloid,.....2</div> <div>Miliary tubercles,....24</div> <div>Movable,.....1</div> <div>Cysts,.....5</div> <div>Infarcts,.....1</div> <div>Tuberculosis,.....1</div> </div>	

AUTOPSY REPORT.

81

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143.....	Size was recorded as,.	Normal,	Left,.....	50	Out of 143 cases.
			Right,.....	44	
		Smaller,	Left,.....	14	
			Right,.....	12	
		Larger,	Left,.....	23	
			Right,.....	35	
	Shape was recorded as,.	Normal,	Left,.....	2	Out of 143 cases.
			Right,.....	0	
		Abnormal, ..	Left,.....	2	
			Right,.....	0	
	Condition was recorded as,.....	Left,	Interstitial nephritis, .	5	Out of 143 cases.
			Parenchymatous nephritis,.....	36	
			Diffuse nephritis,....	4	
			Nephritis not tabulated,	1	
			Congested,.....	19	
			Fatty,.....	15	
			Pale,.....	23	
			Amyloid,.....	8	
			Miliary tubercles,....	27	
			Tubercles,.....	6	
			Movable,.....	1	
			Cysts,.....	8	
			Scars,.....	3	
			Tuberculosis,.....	4	
			Typical large white kidney,.....	4	
		Right,	Interstitial nephritis .	4	
			Parenchymatous nephritis,.....	33	
			Diffuse nephritis,....	3	
			Nephritis not tabulated,	1	
			Congested,.....	20	
			Fatty,.....	12	
			Pale,.....	18	
			Amyloid,.....	7	
			Miliary tubercles,....	24	
			Tubercles,.....	8	
			Movable,.....	1	
			Cysts,.....	8	
			Infarcts,.....	1	
			Scars,.....	3	
			Tuberculosis,	1	
			Anomalous (one-half normal size),.....	1	
			Typical large white kidney	4	

These statistics of the kidneys are made from the gross appearance at the autopsy table.

The differences found between the description of the kidneys at the autopsy and the microscopic findings are at times very great. Authorities, however, agree that at the autopsy table a kidney with practically a normal appearance may show marked lesions of the parenchyma and of the interstitial tissue when viewed under the microscope.

For the year the changes in the kidneys are for the most part of a parenchymatous nature. However, in some cases there are added to this more or less marked interstitial changes. With these organic changes a small isolated miliary tubercle was noted in sixty-one kidneys out of one hundred and fifty recorded. Amyloid changes were recorded in two right and three left kidneys. The probabilities are that the corresponding kidneys in these cases were also affected, but no record was made of them.

The summary for the two years bears out what has been said of the statistics for the year past. This should be studied in connection with Dr. Walsh's report.

SUPRARENALS.

Number of cases autopsied, 88....	Size was recorded as,	Normal both, 54 Increased both, 9 Increased left, 1 Decreased both, 2	} Out of 88 cases.
	Condition was re- corded as,	Normal both, 54 Normal right, 1 Normal left, 4 Tubercles both, 3 Tubercles right, 3 Fibroid both, 8 Fibroid left, 1	

SUMMARY FOR TWO YEARS.

Number of cases autopsied, 143...	Size was recorded as,	Normal both, 54 Increased both, 9 Increased left, 1 Decreased both, 2	} Out of 143 cases.
	Condition was re- corded as,	Normal both, 54 Normal right, 1 Normal left, 4 Tubercles both, 3 Tubercles right, 3 Tubercles, 5 Fibroid both, 8 Fibroid left, 1	

The record here given of the condition of the suprarenals in advanced tuberculosis is fairly accurate from a macroscopic point of view, at least, for the current year, but means nothing for the summary for two years. During the first year five cases were recorded as having tubercles in the suprarenals, and that is all the record that was made for that year. The probabilities are by inference from this that the suprarenals in the other cases were found normal on superficial examination and were not recorded.

BLADDER.

Condition was recorded as,	{	Normal,.....	57	}	Out of 88 cases.
		Distended,.....	5		
		Thickened walls (probably			
		from contraction),.....	18		
		Inflamed,.....	3		
		Tuberculous ulcers,.....	2		
		Affected with tuberculosis, ..	1		

SUMMARY FOR TWO YEARS.

Condition was recorded as,	{	Normal,.....	57	}	Out of 143 cases.
		Distended,.....	7		
		Thickened walls,	18		
		Inflamed,.....	5		
		Tuberculous ulcers,.....	2		
		Affected with tuberculosis, ..	1		

Primary tuberculosis of the bladder is a rare condition. Secondary tuberculosis, following either urogenital tuberculosis or tuberculosis of other organs, is of more frequent occurrence.

Wide-spread tuberculosis of the organ was noted in only one case, while tuberculous ulceration was noted in two cases. "Inflammation" of the organ was noted in three cases. The exact nature of these latter cases is not stated, and may have been of a simple inflammatory nature or of atypical tuberculosis.

In eighteen cases the walls were recorded as thickened, and in all likelihood this condition represents the thickened walls of contraction of the organ and was not meant to convey the idea of a pathological condition.

PROSTATE.

Condition was recorded as,	{	Normal,	40	}	Out of 88 cases.
		Enlargement,	2		
		Tuberculosis,	1		

In only one case was a distinct tuberculous process present. The left lobe of the organ was in this case distinctly caseous.

Enlargement of the organ was recorded in two cases, a very low percentage considering the age and the class of the cases.

URETERS.

The ureters were recorded as,.....	{	Normal,	{	Left,.....	17	}	Out of 88 cases.	
				Right,.....	17			
	{	Abnormal,		Left,.....	1			
				Right,.....	3			
	{	Double,.....		Left,.....	1			
				Right,.....	1			
	{	Dilated,.....		Left,.....	0			
				Right,.....	1			
	{	Tuberculous, ...		Left,.....	1			
				Right,.....	1			

The record of the ureters here given is too incomplete to warrant any conclusions. The probabilities are that frequently the ureter was not examined.

TESTICLES.

The testicles were recorded as, ...	{	Normal,	53	}	Out of 88 cases.
		Left tuberculous,	1		
		Right tuberculous,	1		
		Both tuberculous,	0		

SUMMARY FOR TWO YEARS.

The testicles were recorded as, ...	{	Normal,	53	}	Out of 143 cases.
		Left tuberculous,	1		
		Right tuberculous,	1		
		Both tuberculous,	1		

The testicles were, as a rule, not removed from the body, and the examinations recorded are the result of careful external examination of these organs only. The statistics here given are, therefore, of value only in so far as they record the three cases in which the organ was tuberculous.

OVARIES.

The ovaries were recorded as,....	{	Both normal,.....	6	} Out of 88 cases.
		Both fibroid,.....	12	
		Right normal,.....	1	
		Left fibroid,.....	1	
		Both cystic degeneration,...	2	
		Left cystic degeneration, ...	2	
		Both atrophied,.....	1	
		Right atrophied,.....	1	

The record of the condition of the ovaries for the first year was very incomplete, there being but one record, namely, cystic degeneration in one case. For the second year the record is a little better, but still incomplete. There is no record of tuberculosis of the ovaries for the two years.

UTERUS.

The uterus was recorded as,	{	Size,.....	Normal,.....	18	} Out of 88 cases.
			Large,.....	1	
			Small,.....	3	
		Condition, ..	Retroversion,.....	1	
			Endometritis,	2	
			Fibroid,.....	1	

SUMMARY FOR TWO YEARS.

The uterus was recorded as,	{	Size,.....	Normal,.....	18	} Out of 143 cases.
			Large,.....	1	
			Small,.....	3	
			Infantile,.....	1	
		Condition, ..	Retroversion,.....	2	} Out of 143 cases.
			Endometritis,	2	
			Fibroid,.....	3	
			Senile atrophy,.....	1	
			Cyst in Douglas' pouch,.....	1	

No tuberculous process in the uterus was noted during the two years.

FALLOPIAN TUBES.

The Fallopian tubes were recorded as, ..	{	Normal,.....	17	} Out of 88 cases.
		Ulcerated,.....	2	
		Cystic,.....	1	

The nature of the ulceration in the two cases recorded as ulcerated is not given. There is nothing in the record to throw any light upon the subject of tuberculosis of the Fallopian tubes.

THYROID GLAND.

The thyroid gland was recorded as,	{	Normal,.....	32	} Out of 88 cases.
		Enlarged,.....	10	
		Enlarged right lobe,.....	1	
		Atrophied,.....	13	

Tuberculosis of the thyroid gland is more frequent than is usually supposed. It often will be found in the form of small miliary tubercles, which can be seen only microscopically. These tubercles are from blood infections, and may show isolated small tubercles or coalesced larger tuberculous areas. At the autopsy table no record was made of this condition. One of our staff, Dr. Wm. B. Stanton, by careful microscopic examinations, has been able to find distinct tubercles in many cases.

The relation of simple enlargement of the organ to some of the symptoms in the course of tuberculosis is of interest. Eighteen and one-half per cent. of the cases showed enlargement of the organ.

C. Y. WHITE.

LARYNGOLOGICAL WORK.

Total number of cases ex- amined, 229.....	<div> <div>Tuberculous, 212,.....</div> <div>Non-tubercu- lous, 17,...</div> </div>	<div> <div>Examin- ation of lar- ynx re- corded, 203</div> <div>Examin- ation of lar- ynx not record- ed, ... 9</div> </div>	Laryngeal tuber- culosis,..... 97	<div> <div>Diagno- sis pos- itive, .</div> <div>Diagno- sis not posi- tive,.. 30</div> </div>
			<div> <div>Tuberculosis of pharyngeal tonsil,..... 3</div> <div>Tuberculosis of faucial tonsil, 1</div> <div>Tuberculosis of pharynx, 1</div> <div>Tuberculosis of both larynx and pharyn- geal tonsil, ... 1</div> <div>Tuberculosis of both larynx and faucial tonsil, 1</div> <div>Tuberculosis of both larynx and pharynx, . 1</div> <div>No tuberculosis of the upper air-passages,..104</div> </div>	

SUMMARY FOR TWO YEARS.

Total number of cases ex- amined, 435,.....	<div> <div>Incom- plete rec- ords, ... 22</div> <div>Reported on, ....413</div> </div>	<div> <div>Tuberculous, 389,.....</div> <div>Non-tubercu- lous 24,...</div> </div>	Laryngeal tuber- culosis,.....158	<div> <div>Diagno- sis pos- itive,.. 128</div> <div>Diagno- sis not posi- tive,.. 30</div> </div>
			<div> <div>Tuberculosis of pharyngeal tonsil,..... 2</div> <div>Tuberculosis of faucial tonsil, 1</div> <div>Tuberculosis of pharynx, 2</div> <div>Tuberculosis of larynx and other parts of upper air-pass- ages, 3</div> <div>No tuberculosis of the upper air-passages,..228</div> </div>	

NON-TUBERCULOUS DISEASES OF UPPER AIR-TRACT IN NON-TUBERCULOUS CASES.

Adenoids,.....	1	Rhinopharyngolaryngitis, chronic, ...	2
Adenoids and pharyngitis lateralis, ..	1	Septum, nasal, excoriation,	1
Adenoids and purulent rhinitis,.....	1	Syphilitic ulceration,.....	1
Hay-fever,.....	1	Tonsil, lingual, hypertrophied,	1
Pharyngitis lateralis,.....	1	Tracheitis, acute,.....	1
Rhinitis, hypertrophic,.....	3		—
Rhinopharyngitis, chronic,.....	3	Total cases,	17

NON-TUBERCULOUS DISEASES OF UPPER AIR-TRACT IN TUBERCULOUS CASES.

Adenoids,.....	16	Recurrent nerve paralysis,.....	3
Aphonia, functional,.....	1	Rhinitis, atrophic,.....	6
Arthritis of lower jaw,.....	1	Rhinitis, chronic,.....	3
Cerumen, impacted,.....	2	Rhinitis, hypertrophic,.....	4
Cleft palate,.....	1	Rhinitis, purulent,.....	1
Laryngitis, acute,.....	1	Rhinopharyngitis, subacute,.....	4
" chronic,.....	9	Septum, nasal, deviation,.....	23
" subacute,.....	2	Septum, nasal, excoriation,.....	1
Lingual varix,.....	1	Singer's node,.....	1
Otitis media, chronic catarrhal,.....	14	Sinusitis, acute,.....	1
Otitis media, chronic purulent,	20	Sinusitis, chronic,.....	4
both ears, 4,.....		Tonsil, faucial, hypertrophy,.....	10
Otitis media, chronic purulent,		Tonsil, lingual, hypertrophy,.....	3
right ear, 9,.....		Tonsillitis, acute,.....	1
Otitis media, chronic purulent,	7	Tonsillitis, chronic lacunar,.....	2
left ear, 7,.....			—
Pharyngitis, lateral folds,.....	5	Total cases,.....	145
Polypi, nasal,.....	8		

Chronic rhinopharyngitis of varying degrees and kinds was present in nearly all cases.

TUBERCULOSIS OF UPPER AIR-TRACT.

NOSE.—No cases.

PHARYNGEAL TONSIL.—Total number of cases, 3.

Case No. 2842. Irish woman. Prognosis of lung condition unfavorable (third stage). The pharyngeal vault was deeply congested and the adenoid mass was covered with small white sloughs; an excavated ulcer appeared in the middle. This patient was under medical treatment for three months and improved somewhat, the ulcer healing up. The larynx was normal.

Case No. 2668. Colored woman with advanced lung involvement; under

observation less than a month, when she died. Cervical glands enlarged on both sides, breaking down on the left. Nasal fossæ free. Fauical tonsils slightly enlarged. Pharyngeal tonsil enlarged and ulcerated, dotted with whitish tubercles. Epiglottis and aryepiglottic folds were infiltrated, covered with superficial excoriations. There was pain on swallowing.

Case No. 2099. Irish woman with advanced lung disease; no involvement of the larynx; under observation three months; grew worse. Cervical glands enlarged; nasal fossæ free; faucial tonsils small. Pharyngeal tonsil was red and swollen, and covered with small white nodules suggesting tubercles; later infiltration and ulceration were evident. No dysphagia.

FAUCIAL TONSILS.—Total number of cases, 1.

Case No. 2205. Both tonsils presented infiltrated and ulcerated areas. Prognosis of lung condition doubtful (second stage). Vocal cords and inter-arytenoid folds were congested and infiltrated. The patient had pain on swallowing; was under observation ten months; grew worse under treatment.

PHARYNX.—Total number of cases, 1.

Case No. 2538. Three ulcers were seen on the pharyngeal wall, one about the size of a quarter of a dollar. The epiglottis was red and swollen, preventing a view of other laryngeal structures. The patient was a German woman; lung condition unfavorable (third stage). Both nasal fossæ were very roomy and the cervical glands were enlarged on both sides of the neck. Patient died after being under observation three months.

LARYNX.

Cases of laryngeal tuberculosis, diagnosis positive,.....67	Under twelve years of age,.....	1	} 67
	Between twelve and fifty years of age,...	65	
	Over fifty years of age,.....	1	
	Male,.....	45	} 67
	Female	22	
	Seen by laryngologist once,.....	28	} 67
	Seen by laryngologist more than once,...	39	
	Under observation of staff physician less than one month,.....	6	} 67
	Under observation of staff physician one month or more, on an average seven and five-sixths months,.....	61	
	View of larynx perfect,.....	62	
	View of larynx imperfect,.....	5	} 67

NATURE OF LESIONS.

67	{	Cases of laryngeal tuberculosis, diagnosis positive and view of larynx perfect,.....62	{	Localized congestion,.....39
				Superficial ulceration,.....20
				Infiltration,.....52
				Edema,.....15
				Deep ulceration,.....13
		View of larynx imperfect,.....5		

LOCATION OF LESIONS.

67	{	Cases of laryngeal tuberculosis, diagnosis positive and view of larynx perfect,.....62	{	Vocal cord,.....43
				Ventricular band,.....22
				Interarytenoid fold,.....35
				Epiglottis,.....14
				Aryepiglottic fold,.....36
		View of larynx imperfect,.....5		

PROGNOSIS.

Relation of tuberculous laryngitis to condition of lungs and general health: prognostic significance of laryngeal involvement.

Cases of laryngeal tuberculosis, diagnosis positive, .....67	{	Prognosis based upon lung lesion and general condition at first examination, not upon laryngeal findings*:	}	67
		Favorable,*.....11		
		Doubtful,*.....19		
		Unfavorable,*.....30		
		Prognosis not recorded,.....6		
		Diagnosis of lung disease uncertain,... 1		

RESULT OF TREATMENT AS TO GENERAL HEALTH.

67	{	Cases of laryngeal tuberculosis, diagnosis positive, .....67	{	Died,.....24 = 35.82 per cent.
		Cases of laryngeal tuberculosis, diagnosis positive, under treatment less than one month,.....6		Remained same, . 2 = 33.33 per cent.
				Died,.....4 = 66.66 "
		Cases of laryngeal tuberculosis, diagnosis positive, under treatment for one month or more, on an average seven and five-sixths months,.....61		Improved,.....20 } 44.26 per cent.
				Remained same, . 7 }
				Grew worse,.....14 } 55.73 per cent.
				Died,.....20 }

* Terms "favorable," "doubtful," and "unfavorable," approximately represent stages of lung disease, according to Turban's classification.

SIGNIFICANCE OF LESION AS TO IMPROVEMENT OF GENERAL HEALTH.

67	Cases of laryngeal tuberculosis, diagnosis positive, under observation less than one month, .. 6	Cases with localized congestion, superficial ulcer, or infiltration,..... 2	Remained same, .. 1 Died,..... 1	
		Cases with localized congestion, superficial ulcer, or infiltration with edema, 2	Remained same, . 1 Died,..... 1	
		Cases with localized congestion, infiltration, superficial ulcer, or edema with deep ulceration, .. 1	Died,..... 1	
		View of larynx imperfect,..... 1	Died,..... 1	
	Cases of laryngeal tuberculosis, diagnosis positive, under observation for, on an average, seven and five-sixths months,..61	Cases with localized congestion, infiltration or superficial ulceration,.....38	Improved,.....15 Remained same, . 7 Grew worse,.....10 Died,..... 6	57.87 per cent. 42.10 per cent.
		Cases with localized congestion, infiltration, or superficial ulcer with edema,..... 8	Improved,..... 2 Remained same, . 0 Grew worse,..... 1 Died,..... 5	25 per cent. 75 per cent.
		Cases with localized congestion, infiltration, superficial ulcer, or edema, with deep ulceration, ...11	Improved,..... 2 Remained same, . 0 Grew worse,..... 3 Died,..... 6	18.18 per cent. 81.81 per cent.
		View of larynx imperfect, 4	Improved,..... 1 Remained same, . 0 Grew worse,..... 0 Died,..... 3	

SIGNIFICANCE OF LOCATION AS TO IMPROVEMENT IN GENERAL HEALTH.

67	Cases of laryngeal tuberculosis, diagnosis positive, under observation less than one month, .. 6	Cases with lesion of vocal cord, ventricular band or interarytenoid fold (intrinsic),..... 2	Remained same, . 2	
		Cases with lesion of epiglottis or aryepiglottic fold (extrinsic),..... 2	Died,..... 2	
		Mixed cases,..... 1	Died,..... 1	
		View of larynx imperfect,..... 1	Died,..... 1	

SIGNIFICANCE OF LOCATION AS TO IMPROVEMENT IN GENERAL HEALTH.—
(Continued.)

67	Cases of laryngeal tuberculosis, diagnosis positive, under observation for, on an average, seven and five-sixths months, . . . 61	Cases with lesion of vocal cord, ventricular band, or interarytenoid fold (intrinsic), 22	Improved, 10	} 63.63 per cent.
			Remained same, . . 4	
			Grew worse, 5	} 36.36 per cent.
			Died, 3	
		Cases with lesion of epiglottis or aryepiglottic fold (extrinsic), 2	Improved, 0	} 0 per cent.
			Remained same, . . 0	
			Grew worse, 1	} 100 per cent.
			Died, 1	
	Mixed cases, 33		Improved, 9	} 36.36 per cent.
			Remained same, . . 3	
			Grew worse, 8	} 63.63 per cent.
			Died, 13	
	View of larynx imperfect, 4		Improved, 1	}
			Remained same, . . 0	
			Grew worse, 0	
			Died, 3	

There were thirty patients who suffered from odynphagia in varying degrees.

Treatment.—The treatment used was: nasal wash in one hundred and one cases; gargle in sixteen cases; inhalation in three cases; laryngeal applications in forty-seven cases; intratracheal injections in two cases; galvanocautery in four cases; operation in six cases; x-ray in one case.

The medicines used were: Washes and sprays: Boric acid; Dobell's solution; zinc sulphate, 2 %; camphor-menthol-albolene. Gargle: Chlorate of potash. Applications to nose: Iodoglycerin; glycerite of tannic acid; protargol, 7 %; balsam of Peru. Applications to pharynx: Nitrate of silver, 10 to 60 gr. to 1 oz.; glycerite of tannic acid; euophen in oil; zinc sulphate, 2 %. Applications to larynx: Zinc sulphate, 2 %; euophen in oil; menthol, 5 gr., creasote, 5 m., olive oil, 1 oz.; lactic acid, 20 to 50 %; protargol, 7 %; formalin, 0.5 to 3 %; cocain hydrochlorate, 4 to 8 %. Cocain lozenges and orthoform lozenges were sometimes ordered for odynphagia and occasionally gave good results.

W. G. B. HARLAND.

NEUROLOGICAL WORK.

The neurological work published in the First Annual Report of the Institute was based, for the main part, on the examination of the advanced cases in the Institute. Inasmuch as this did not give the proper idea of the nervous manifestations of tuberculosis in general, it was deemed advisable to carry out an investigation of cases in all stages of the disease coming to the dispensary. This has been done by Dr. Carncross. The work was not begun until late in the year, but detailed records of one hundred and seventy-three cases were obtained. Dr. Carncross reports some of the work in this volume.

The report here presented will give the conclusions arrived at from the study of seventy-six brains removed from cases of advanced tuberculosis. Two new headings have been added to the classification already submitted in the first year's report:

Headings under C. (Lesions of the Brain): "Localized cortical and subcortical hemorrhagic softening secondary to tuberculous lesions of the meninges." This is an undescribed manifestation of tuberculosis, and is presented here for the first time.

Heading under D. (Affections of the Spine, the Spinal Cord, and Its Meninges): "Ganglion-cell degeneration of toxic origin."

A study of two cases which do not properly belong to this year's report has been included in it because the cases have a distinct bearing upon the subjects under discussion. The first, No. 2676, was carefully studied during the year, and

died shortly after the year terminated. In the statistical study of the autopsy work the case should be considered in the report to follow this one. The clinical study of it, however, should be considered in this one. In order to have it discussed in its entirety in one place, it is reported in full this year. The other case, No. 3440, should likewise be considered in next year's report, but has been considered in this because, besides being a unique case with important clinical and pathological findings, it illustrated another phase of the subject of localized meningitis.

No cases of tuberculosis of the bones of the "skull with secondary involvement of the meninges" have come under our observation during this year.

ACUTE LEPTOMENINGITIS.

Number of brains upon which report is based,78
 Number of cases, 5

In three of these cases tuberculous meningitis was restricted to one area of the brain. In two of the three cases the meningitis was restricted to the posterior fossa, affecting the cerebellum, the pons, and the medulla. One case was the usual type of extensive tuberculous meningitis affecting the base and the convexity. One case presented a proliferative type affecting the meninges of the brain and the spinal cord.

The occurrence of localized forms of meningitis in advanced cases of tuberculosis is of considerable interest. One of the cases of tuberculous meningitis restricted to the posterior fossa of the brain was described in last year's report. The other case follows the same type. A thick plastic exudate was present over the superior surface of the cerebellum, with an inflammation of a minor degree over the inferior surface, the pons, and medulla. The symptoms produced in both cases were not so distinct as would naturally be expected from the extent of the lesion. It

should be remembered, however, that both cases were bed cases, in a very advanced stage of tuberculosis, and that disturbance of gait, position, etc., would not be so manifest under such circumstances as they would have been had the cerebral lesions been uncomplicated by the intense weakness and toxemia of the pulmonary condition. Persistent occipital headaches, rigidity of the muscles of the neck, increased reflexes, marked fatigue, and terminal delirium were present in both cases. Neither of the two cases were diagnosed ante-mortem.

TUBERCULOUS MENINGITIS RESTRICTED TO ONE CEREBRAL HEMISPHERE.

This case presented the lesions of a typical tuberculous meningitis confined to one cerebral hemisphere and more particularly to the distribution of the Sylvian artery. The case is of considerable interest both from a clinical and pathological standpoint. It represents, from a pathological standpoint, a method of infection of the cerebral meninges from a pulmonary lesion. The localization of the inflammation in this case to the distribution of one cerebral artery is evidence of the transmission of the infection through the arterial circulation. The case is as follows:

Case No. 3440. Age, twenty-six. Admitted 6—14—'05. Died 8—11—'05.

Two sisters had died of pulmonary tuberculosis. The patient had had the usual diseases of childhood; pleurisy sixteen months ago; and gonorrhea five years ago. He had had pulmonary tuberculosis for the last sixteen months, and presented miliary involvement of the entire right lung and of the upper lobe of the left lung. The pulmonary condition advanced during the two months at the Institute, with, however, gradual reduction in temperature, which varied between 101° and 102° F. The examination of the urine showed acidity, specific gravity 1022, a slight trace of albumin, no sugar, diazo reaction positive, and a few granular and wax-like casts. The patient had two slight hemorrhages, one on July 12th and one on July 24th.

Dover's powder had been administered on August 1st. On August 2d he had convulsions, Jacksonian in type, beginning in the left arm. He did not complain of headaches, and rested in fairly good condition until August 3d, when he had another convulsion. On August 4th there is a record of four convulsions; on August 5th, seven; August 6th, nine; August 7th, thirty-seven; August 8th, fifty; August 9th, fifteen; August 10th, twenty-five, and August 11th, thirty. On August 7th complete paralysis of the right arm and leg developed, with complete loss of power in the right face. The notes of the examination are as follows:

"The patient is conscious, understands what is said to him, and obeys simple commands, such as protruding the tongue, closing the eyes, lifting the arm, etc. He is able to repeat simple words, such as 'yes' and 'no,' but is unable to hold articulate conversation. The right arm and leg are completely paralyzed and flaccid. The left arm and leg have apparently normal power. The knee-jerk on the paralyzed side is present and quick and weak. There is no ankle clonus on either side. The Babinski reflex is present on the right side. There is some hyperesthesia of the right side. Flexing the arm or the leg produces pain. The pupils are unequal, both more than middle wide, and the left larger than the right. There is no rigidity of the muscles of the neck to-day (slight rigidity was noted in the examination on August 8, 1905). Immediately after the examination the patient had a convulsion which began with slight moaning and clonic jerkings beginning in the right hand and extending rapidly to the face and leg of the right side. The head was turned to the right and the right eye was closed by a clonic spasm of the orbicularis. Both eyes were rotated to the right. During the convulsions he placed his left hand on the twitching mouth. There is some question as to whether consciousness was entirely lost on account of this movement. There were slight twitchings of the muscles of the face. He responded to simple commands immediately after the convulsive movements ceased. If consciousness was lost, it was only momentary. In an attempt to close the eyes in response to a command immediately after a convulsion, the right eye did not close entirely, showing some weakness.

"The diagnosis rests between a localized infiltrating tuberculous lesion confined to the left hemisphere, cerebral hemorrhage, and uremia. The history of the onset points to uremia. The examination of the urine at this time showed only a slight trace of albumin, specific gravity 1026. The mental condition, pulse, and general examination are also against the diagnosis of uremia. The onset, the mental condition, and the localized convulsions are against the diagnosis of cerebral hemorrhage, and therefore in favor of a

diagnosis of a localized inflammatory infiltrating tuberculous process of the left cerebral hemisphere."

AUTOPSY REPORT.—*Examination of Brain and Spinal Cord.*—"On gross examination of the spinal cord there is a localized fibrinous exudate over the entire cervical part of the cord. Examination of the brain shows an acute tuberculous meningitis extending over the upper portion of the temporo-sphenoidal lobe and over the entire motor area of the left side. The frontal area is edematous; the occipital lobe is not at all involved. The base of the brain is practically normal. There is considerable edema of the left hemisphere. The right hemisphere is normal.

Microscopic examination shows inflammatory infiltration of the meninges, with tubercle bacilli in large numbers in the tissues.

A careful study of the clinical picture in this case will show the difficulty of making a positive diagnosis. The case, as stated in the clinical notes reported at the time, was at first thought to be one of uremia, on account of the onset of the symptoms after the administration of opium to a patient who had previously shown evidence of kidney disease. The further study of the case led to the rejection of this diagnosis and the consideration of the possibilities of cerebral hemorrhage, cerebral thrombosis, brain tumor, and meningitis.

While hemiplegia with complications is of frequent occurrence in uremia, and especially where the uremia occurs in individuals with cerebral arteriosclerosis, it is always associated with other evidence of deficiency of kidney function. A careful quantitative and qualitative analysis of the urine reveals evidence of deficiency of elimination. The total quantity of the urine or of its solid constituents (urea, etc.) is diminished. Albumin may or may not be present. Its presence is frequently in small quantities, and often only periodical. This is especially true in contracted states of the kidney. There is also evidence of uremic intoxication in the circulatory system, in the action of the heart, and the high tension of the pulse. The examination of the eye-grounds will sometimes show an albuminuric retinitis. The mental condition of the patient is always an important factor in the diagnosis of uremia. Consciousness is practically never retained when the convulsions are so frequent as they were in the case under discussion. The hemiplegia of uremia, if carefully studied and kept under close and continuous observation, will often be found to be intermittent. There will be a diminution or complete disappearance of paralytic symptoms from time to time. In the absence of practically all these symptoms with the exception of the convulsions, the diagnosis of uremia was excluded.

The gradual onset of the symptoms, the increasing frequency of the con-

vulsions of a Jacksonian type, the retention of consciousness, and the condition of the heart and pulse excluded cerebral hemorrhage.

The frequency and the character of the convulsions excluded the diagnosis of cerebral thrombosis.

The symptoms of brain tumor develop much more slowly and are more frequently associated with changes in the eye-grounds than in this case.

The retention of consciousness is of much interest in view of the pathological findings. Consciousness is lost in tuberculous meningitis relatively early in the course of the disease. It is also lost, as a rule, in uremia. It is invariably lost in extensive cerebral hemorrhage. The retention of consciousness in this case, therefore, becomes of considerable diagnostic value. It indicates that we are not dealing with the usual type of tuberculous meningitis. The convulsions, the hemiplegia, the aphasia, localize the lesions to the left cerebral hemisphere, and especially to the motor area. The rapid development of the symptoms complicating the advanced pulmonary tuberculosis led to a final diagnosis of a localized inflammatory condition of the meninges of the left cerebral hemisphere.

The transmission of the infecting agent from localized tuberculous foci to the meninges has been a matter of discussion for a long time. Where a tuberculous focus is in the immediate neighborhood of the meninges, the transmission may be by direct extension of the inflammatory process or by lymphatic transmission. Such foci are found in the bones of the skull—the mastoid, middle ear, ethmoid, nasal, and frontal sinuses. Lymphatic transmission in this class of cases is much more frequent than infection by direct extension. When tuberculous meningitis immediately follows operation upon a tuberculous joint, it is difficult to understand how the infection could be otherwise than by direct blood transmission. Infection of the meninges complicating slight tuberculous lesions of the chest, such as tuberculosis of the peribronchial glands, etc., might be the result either of blood or lymphatic transmission. In very advanced cases of pulmonary tuberculosis with extensive cavity formation various types of tuberculous meningitis may occur. The presence of tubercles from the size of a millet seed to that of a split pea, in many tissues of the body, in a large number of cases (see pathological report), points to a tuberculous bacteremia. It is surprising that tuberculosis of the meninges is not found with more frequency in such cases. The subacute leptomeningitis described later on cannot be considered as a tuberculous process, but rather as a result of continuous toxic irritation.

In miliary tuberculosis of the meninges the tubercles are found in the greatest number along the course of the blood-vessels. Hektoen has described them within the blood-vessels.

Localization of the tuberculous lesions in this particular case to an area corresponding to the blood supply of one particular cerebral artery could not otherwise be explained than by a local infection in the distribution of this blood supply. There is, however, a possibility of lowered resistance due to interference in circulation leading to a localized infection. The type of inflammation and study of the rest of the brain does not give any support to this theory.

The study of a large number of cases of acute tuberculous meningitis will show two distinct types entirely different in their gross and microscopic pathology.

In one group of cases the meninges are in a state of congestion, and large numbers of small pin-point miliary tubercles are found scattered along the course of the blood-vessels. In the other there is a thick plastic semipurulent exudate mainly confined to the base of the brain, and most extensive in the intercrural space. The first group of cases corresponds to the type usually found in children, and where the primary source of infection is a non-suppurating tuberculous focus. This type is also found in advanced cases of pulmonary tuberculosis. In the advanced cases with cavity formation and mixed infection the second group is more common. The second type is with the plastic semipurulent exudate over the base. It is rare to find in these cases any exudate over the convexity, although there often is extreme congestion and acute inflammation of the meninges. This condition represents a marked accentuation of the pathological condition described under the case heading "Subacute Leptomeningitis." The difference in the pathological manifestations of these two groups is in all probability determined by mixed infections.

SUBACUTE LEPTOMENINGITIS.

Number of brains examined,	78
Number of cases,	17

Little has been added on this subject to what was presented

in last year's report. In the recorded number of cases the frequency of this change remains the same. In eight of the seventeen cases the change is recorded as slight. In the other cases the change varies from a slight roughening of the meninges to a plastic exudate. This condition is most marked, as a rule, on the base of the frontal convolutions. In some of the cases it is most marked over the inferior surface of the temporosphenoidal lobes. In the cases where the exudate is thickest the microscopic picture shows a layer of granular material containing a few small round nuclei. In this there is evidence of proliferation of the cells of the meninges. There is nothing in the clinical history of this group of cases to point to the pathological lesion in the brain.

The transition from this condition to a more marked plastic exudate, which is recognized as the pathological manifestation of one type of tuberculous meningitis of the base, is a gradual one and can be considered only as a variation in degree of the same process.

CHRONIC LEPTOMENINGITIS.

Number of brains examined,.....	76
Number of cases,.....	6

These pathological lesions are restricted to the convexity, and while they are distributed over an irregular wide-spread area, are most intense in the distribution of the middle meningeal artery. The influence of alcohol appears to be a determining factor in all these cases. This condition must be distinctly differentiated from the apparent thickening of the meninges which is presented in cases of marked atrophy of the cortical convolutions. The microscopic examination easily differentiates the two conditions. In the former there is an increase in the vascularity, with a marked proliferation of the connective-tissue cells. In one of the cases there was a recent marked subacute leptomeningitis over the base, and in another,

a chronic fibroid thickening of the meninges of the pons and the medulla.

**CHRONIC TUBERCULOUS MENINGO-ENCEPHALITIS.
(LOCALIZED CORTICAL AND SUBCORTICAL HEMOR-
RHAGIC SOFTENING SECONDARY TO TUBER-
CULOUS LESIONS OF THE MENINGES.)**

Number of brains examined, 110
Number of brains affected, 4

In four of the one hundred and ten cases which have been studied at the Henry Phipps Institute and the Philadelphia Hospital, areas of cortical softening have been observed. The gross appearance of this condition was so different from that seen in obliteration of the terminal vessels of the circle of Willis that a careful microscopic investigation of all four cases was made. The anatomical distribution of the terminal vessels of the circle of Willis is such that when softening occurs from obstruction, there is either collapse or complete disappearance of the gyri affected. In none of the cases was there evidence of advanced or even moderate arteriosclerosis of the vessels elsewhere in the brain. In none of the cases was a unilateral hydrocephalus observed. In none of the cases was there any deformity of the gyri other than a superficial erosion. Sections of the pia-arachnoid establish the presence of small caseating tubercles containing tubercle bacilli over one of these areas, and leads me to conclude that the primary lesion is a local inflammatory tuberculous lesion of the pia-arachnoid, with secondary involvement of the cortex, either by direct extension or, more properly, a local interference with the local cortical circulation by obliteration of the capillaries extending into the cortex from the meninges. Another possibility is a lowered resistance of the meninges over areas of primary softening of the cortex and a deposit of tubercles in this area. In one of

the cases the presence of fibrous nodules in the pia-arachnoid in other areas of the brain was evidence of a previous local inflammatory disease of the meninges. This supports the former theory. The cases are as follows:

Case No. 2676. Age, forty. Weaver. Admitted to the Henry Phipps Institute 8—11—'04, from White Haven. Died 2—1—'05.

One sister had died from consumption. He had influenza in 1893; pleurisy in September, 1893; and had used alcohol to excess. He had been ill with his present trouble for over a year. There was an involvement of both lungs, affecting the entire upper lobe of both sides. While at White Haven he had decided mental disturbance. He had hallucinations of hearing, systematized delusions of persecution, deficient memory, and poor judgment.

The nervous examination made 1—14—'04, gave no evidence of organic disease in the central nervous system. "The reflexes are quick and the muscular power good; there is a fine tremor in both hands. The patient still has systematized delusions of persecution. The memory is poorer than it was, and is very deficient to both recent and past events."

AUTOPSY RECORD.—Pathological Diagnosis.—Infiltrating tuberculosis with cavity formation of the entire right lung and of the upper lobe of the left lung. Tuberculous ulcerated appendicitis. Amyloid disease of the liver, spleen, and kidney.

Nervous System.—Gross examination: There is no atrophy of the cortical convolutions. There is no edema. There is moderate passive congestion, more marked on the right side. There is a slight grade of internal hydrocephalus. There is no arteriosclerosis apparent in the circle of Willis. The vessels appear to be soft, normal, and collapsed. There is a slight roughening over the base of the frontal lobes. There are a number of whitish areas in the pia along the course of the blood-vessels of the anterior portion of the base of both temporosphenoidal lobes. These are fibrous in nature. The pacchionian granulations along the anterior edge of the cerebellum are more numerous than elsewhere.

In the right hemisphere there are two extensive areas of superficial softening involving only the gray matter of the cortex, not associated with other deformity of the gyri. There is one area 4 x 3 cm. in the extreme anterior portion of the first and second frontal convolutions. The other area 3 x 2 cm. is in the posterior portion of the second frontal convolution with its posterior margin just anterior to the ascending frontal convolution.



FIG. 1.—Areas of hemorrhagic meningo-encephalitis, secondary to tuberculosis of the meninges. Tubercle bacilli were present in the caseous nodules over the anterior area of softening.

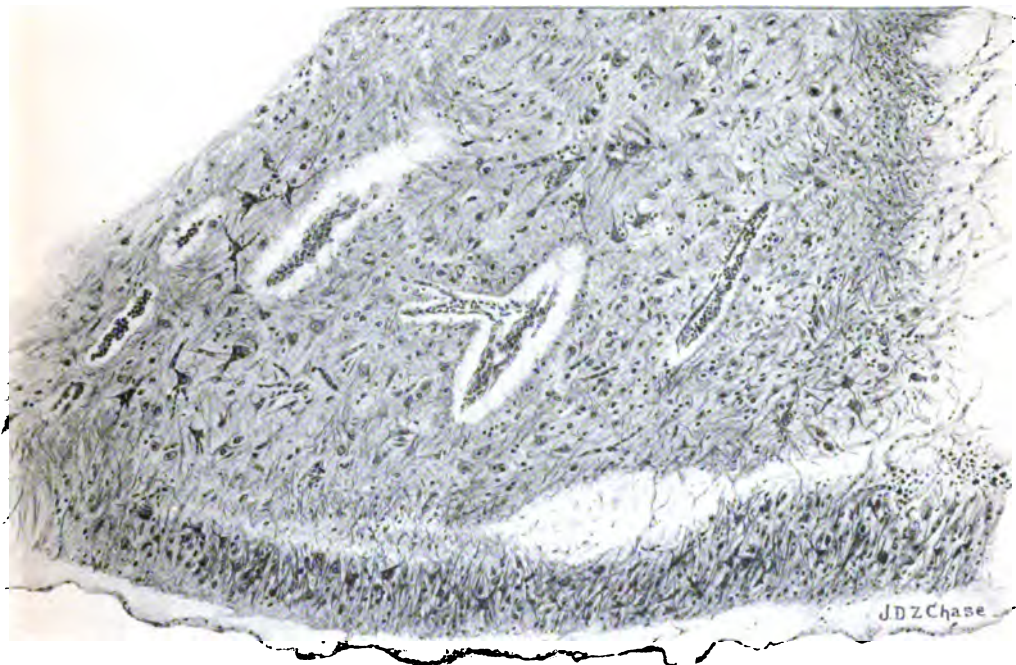


FIG. 2.—Microscopic section through the border of the larger area of meningo-encephalitis in Fig. 1. The rarefaction of the cortex is seen immediately beneath the pia. The hypertrophy of the neuroglia cells is marked along the inferior border of the section. Along the left margin of the section, several fragmented, degenerated, ganglion cells, the result of iron infiltration, are shown.

In the posterior area the pia remains intact. This area is slightly depressed below the surface, and is yellowish brown in color. Along the entire posterior edge of this area there is a large number of small white fibrous nodules, the size of millet-seeds. They are situated in the pia along the course of the veins. In the middle of this area there are a few yellow caseous granules. Tubercle bacilli were found in these granules.

The anterior area is similar in appearance to that above described, but is more extensive in its dimensions. There are a number of small white fibrous nodules at its periphery, but they are not so numerous as in the posterior area. The same yellowish-white granules are seen here and there on the surface. There is evidence of calcification in some of the yellowish-white areas. The veins and a larger branch of the anterior cerebral artery cross this area intact.

Microscopic examination: Sections were taken from the large areas of softening in the prefrontal lobe of the right side, and were stained by the Nissl, hematoxylin-eosin, elastic, iron hematoxylin, van Giesen, and Marchi methods.

Hematoxylin-eosin method: The area of softening is seen to involve the cortex and a very slight portion of the subcortex. The pia-arachnoid is intact, and both arteries and veins can be seen permeating the pia of this area. The meshwork of the pia-arachnoid is thickened and contains large quantities of dark pigment of degenerated blood, free and within larger cells. Immediately beneath the pia-arachnoid the brain-substance has a reticular appearance, and in the immediate neighborhood along the free surface of the brain, just beyond the area of softening, there is a proliferation of the neuroglia. The blood-vessels appear to be normal. There is no evidence of distinct arteriosclerosis. The ganglion-cells in the immediate neighborhood of softening stain more deeply than those at some distance. There is some displacement of the nuclei in the cells in the area of softening. The remainder of the cortex, by this method, does not show any pathological change. The nuclei in the cells of the nucleus of the tenth nerve are displaced toward the periphery, and the cells stain deeper than normal. Within one of the venous channels of one of the pacchionian granulations numerous circular hyaline bodies staining a purple color with the hematoxylin are seen, attached to the wall of the venous channel.

Iron hematoxylin stain: This stain gives the same changes as have been described in the preceding method. Small capillary hemorrhages stained a deep jet black are present beneath the floor of the fourth ventricle. The pigment in the areas of softening stain a jet black by this method.

The van Giesen method gives practically the same changes as those seen by the hematoxylin-eosin method. The blood-vessels stain much more distinctly. There is no evidence of obstruction. There are immediately beneath the area of softening a few capillaries, about which is a mass of delicate fibrils which stain red by this method. There are small capillaries extending into the cortex from the pia-arachnoid, and the red-staining fibrils are in all probability extensions from the pia-arachnoid.

Nissl method: The area of softening in this case extends through the cortex and involves only very slightly the subcortex. In the immediate neighborhood, that is, at the edge of the area of softening, the ganglion-cells take a very deep blue stain. There are ganglion-cells in a condition of advanced degeneration, with complete disappearance of the chromophilic elements, and still others in an intermediate stage with displacement of the nucleus and diffuse chromatolysis. Through the area of softening in the rarefied cortex and in the pia-arachnoid there are quantities of a golden and of a dark-brown pigment. A few of the cells scattered here and there throughout the cortex are in a condition of pyknosis. The cortex is otherwise normal.

Elastic stain: All the sections were stained by Wiegert's elastic stain in order to determine the extent of change in the blood-vessels. The elastic coat is intact and does not appear to be abnormal in the larger vessels within the area of softening. Apart from the slight thickening of the media in the vessels at the base of the brain there is no evidence of pathological change.

Case No. 2347. Age, thirty-nine. Color, white. Occupation, steam-engineer. Admitted 5—3—'04. Died 6—10—'04.

Family history negative. The patient had been ill for three years with typical pulmonary tuberculosis. There was a wide-spread involvement of both lungs with cavity formation, including the whole upper left lung. There was no nervous examination. The gross pathological diagnosis in the autopsy record is: "Tuberculosis in both lungs, bronchiectasis in the left lung, thickened pleura, pericarditis, fatty kidneys, fibroid adrenal of left side, calcification of splenic artery, fatty infiltration of the liver, and ulcers in the cecum."

Gross examination of brain: There is no external or internal hydrocephalus. There is no arteriosclerosis of the circle of Willis. The meninges over the convexity appear to be normal. On the left side of the brain there are four spots of hemorrhagic softening, superficial in type, which are not connected in their anatomical arrangement with the distribution of the cortical blood-supply. In all areas of softening the pia-arachnoid remains intact, and the softening does not extend to a greater depth than 2 mm. The most

extensive area in this case occupies the anterior distribution of the third cerebral convolution of the left side, and measures 4 x 2.5 cm. There is a smaller area measuring 1 x 2 cm. in the middle portion of the first temporo-sphenoidal gyrus. There is a small area, 1 x 3 mm., in the posterior portion of the second temporosphenoidal gyrus. There is still another area, 6 x 3 mm., in the posterior portion of the third temporosphenoidal gyrus. There are no areas of softening in the right hemisphere. All the areas have a reddish-yellow appearance and are slightly depressed below the surface. They are covered by a thickened pia-arachnoid, through which the venous capillaries can be seen. Sections from the hemispheres reveal no pathological change in the centrum semiovale.

Microscopic examination: Sections were taken from the areas of softening, from the motor area, pons, and medulla, and stained by the Nissl, hematoxylin-eosin, elastic, iron hematoxylin, van Giesen, and Marchi methods.

By the hematoxylin-eosin method the vessels in the immediate neighborhood of the areas of softening are patulous. Arterial and venous capillaries are present in the softened areas and appear to be normal. The same is true of the intergyral vessels. Over the area of softening the pia-arachnoid is distinctly thickened and contains a large number of cells carrying hemosiderin. Immediately beneath this and continuous with it the cerebral tissues, both cortical and subcortical, are reticular in character, through which the blood-vessels run intact, and in which only a few degenerated ganglion-cells can be seen. This reticulated tissue is composed mainly of neuroglia fibers, with here and there a swollen axis-cylinder; these latter are especially numerous at the junction of the reticular tissue with the surrounding area. At the edge of the area of softening there is a marked proliferation of the neuroglia tissue, with the formation of large spider cells, and here and there a fan-like arrangement of hypertrophied neuroglia fibers. The neuroglia cells, even at some distance from the area of softening, immediately beneath the pia, are hypertrophied. The few ganglion-cells that remain in the area of softening and those in the immediate neighborhood stain a purple black with hematoxylin. The nuclear area alone remains clear and unstained. The entire cell body has a black, granular appearance. The dendrites are swollen and fragmented. The ganglion-cells in the rest of the section take a light-blue stain. In the neighborhood of one of the areas of softening a small area of calcification was present in the pia-arachnoid. There was considerable thickening in the immediate neighborhood of the area of calcification, without, however, any pathological change in the cortex immediately beneath it.

Iron hematoxylin method: All the changes above described are apparent and much more distinct in the microscopic picture by this method. This is especially true of the ganglion-cells, the neuroglia cells, and the fibers in the immediate neighborhood of the area of softening, all of which take a deep black stain by this method. A number of cells having the appearance of compound granule-cells and taking a light-blue stain and at times a yellowish stain were present in the area of softening. The myelin in the sub-cortex takes a normal blue stain.

Van Giesen method: This method presents no evidence other than that of the other methods. The blood-vessels appear normal, and there is no evidence of obstruction of the subcortical vessels.

Nissl method: Ganglion-cells in all stages of degeneration from simple pyknosis to complete chromatolysis can be seen in the immediate neighborhood of the softening areas. In some of the cells evidence of proliferation is shown by a double nucleus in a single ganglion-cell. Care was taken in this observation to exclude a superimposition of cells, a leukocyte within a cell, or vacuolization of the cell. The cells above described as taking a purplish black stain with the hematoxylin-eosin method and a deep black stain with the iron hematoxylin, take a blue granular stain by this method. A type of cell-degeneration is seen here, and resembles that occasionally met in toxic degeneration; one or several fine filaments of chromatin extend from one pole of the cell to the other, the rest of the cell-body remaining in a condition of diffuse chromatolysis and taking the blue stain very slightly.

Sections taken from the motor area present nothing pathological. The pons, cerebellum, and medulla show nothing abnormal with the exception of a perinuclear chromatolysis of the cells of the tenth nerve. Two small tubercles are present on the choroid plexus.

Elastic stain: A study of the sections stained by the elastic method does not show any marked pathological change in the walls of the vessels.

Case No. 3142. Age, twenty-six. Occupation, bookkeeper. Admitted 3—1—'05, in an advanced stage of pulmonary tuberculosis with cavities in both lungs. He had been ill for three years.

The nervous examination showed an accentuated condition of all the reflexes. There was no loss of muscular power or sensation. Objective examination was normal. The patient complained of marked hyperesthesia of both feet, with tenderness of all the toes except the big toe. There was marked curving of all the nails of the toes. There was no evidence of an active neuritis. The mental condition had changed distinctly since the lung



FIG. 3.—Tuberculous meningitis in the distribution of the middle cerebral artery. The microscopic sections showed a mixed septic and tuberculous meningitis. Tubercle bacilli were present in the meningeal exudate.

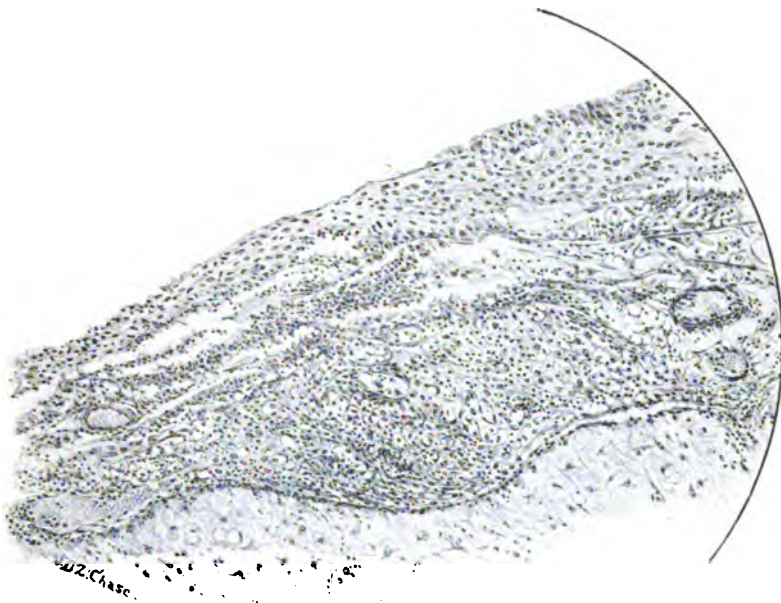


FIG. 4.—Microscopic section. Productive tuberculous meningitis. There is marked fibroid proliferation of the pia-arachnoid. There is also a well-developed reticulum of connective-tissue cells in the exudate between the pia and the cortex.

condition had become advanced. He was very suspicious of the intentions of all about him—a mental attitude which almost amounted to delusions of persecution. His memory was poor and he was of a markedly irritable, complaining disposition.

Microscopic examination: Hematoxylin-eosin method: In this area the pia is retained and thickened. The cortex has disappeared; the subcortex shows a reticular appearance, and at the edge of this there is a thin layer of marked gliosis. The subcortical vessels are normal. In the area of gliosis, beneath the reticular area, the glia-cells are markedly hypertrophied and present the form of spider-cells. Some capillaries in one portion of the reticular area are patent, but do not contain red blood-corpuscles. In the smaller areas, evidently the beginning of the process, the outer cortical area is reduced to a delicate reticulum of neuroglia fibers. In this reticulum at one point there is an obliterated capillary vessel. The ganglion-cells immediately underlying the reticular area of the cortex are in different stages of degeneration, and at one point show some calcification. In the neighborhood of both these areas the ganglion-cells, by the Nissl method, show all stages of degeneration.

Nissl method: The ganglion-cells within the neighborhood of the area of softening are mainly in a condition of advanced pyknosis. Some of them are in a condition of more advanced degeneration than advanced pyknosis, with complete chromatolysis.

Case No. 3388. Age, thirty-six. Occupation, carpenter. Admitted to the Institute 5—29—'05.

One brother has tuberculosis. The patient had denied syphilis or other venereal infection and did not use alcohol. He had had tuberculosis for six months and pneumothorax for several weeks previous to death. There were no mental or nervous phenomena out of the ordinary. The autopsy showed a left-sided pyopneumothorax with cavity formation and infiltration of the upper and middle lobes of the right lung.

Microscopic examination: Hematoxylin-eosin method: The areas of softening in this case differ from those in the preceding cases. There is a comparative absence of hemorrhagic pigmentation. These areas are composed of a series of smaller areas in which there is a marked rarefaction of the cortex. In the subcortex there are rather extensive areas surrounding the blood-vessels, in which there is an absence of the neuroglia reticulum, the space being filled with red blood-corpuscles, small mononuclear cells, and proliferated neuroglia cells. An area, 3 x 1 cm., of subcortical softening

independent of the other areas, is present in one of the sections. Several capillary blood-vessels run through this area and are apparently normal. The neuroglia network and ganglion-cells of the cortex within this area have entirely disappeared. The neuroglia cells are markedly proliferated and contain large quantities of the hemorrhagic pigment. The rest of the central nervous system shows nothing abnormal with the exception of a few capillary hemorrhages beneath the surface of the fourth ventricle of the pons and the medulla.

A study of the clinical records of the above cases gives unsatisfactory results. In only one of the cases was there evidence of distinct disturbance of the cerebral function. Case No. 2676 presented a clinical picture of a delusional type of insanity with systematized delusions of persecution, marked egotism, loss of memory, etc. There was no previous history of mental disease, and the mental disturbance developed while the patient was under observation. In another case, No. 3142, there was a very marked change in the mental condition while under observation. Although this could not be considered as an insane state, it was a distinctly pathological mental condition. Inasmuch as the same mental condition is present without cortical softening, there is no reason why the one should be considered as a result of the other. The only conclusion that can be deduced from the study of these four cases is that there is a type of cerebral cortical softening secondary to a localized tuberculous inflammatory lesion of the meninges.

TUBERCULOSIS OF THE CHOROID PLEXUS.

Number of brains examined,.....	57
Number of cases,	9
Doubtful cases,.....	2
Cystic choroids,.....	3

Two of these cases were associated with acute tuberculous meningitis. The tubercles in both cases were small and situated on the ventricular surface of the choroids.

In a case of chronic ulcerative tuberculosis the tubercles

were of different structure. The small tubercles in the same case were fairly well organized and of hard consistence. In the larger tubercles the microscopic sections showed a raked-field appearance, with granular degeneration of the nuclei in the center. Yellow, caseating tubercles were observed in two cases. The tendency in the choroids is to organization of the tubercles into fibroid tissue. In the absence of giant-cells it is not an easy matter to distinguish the tuberculous formation unless the other characteristic appearances of tuberculous tissue are present. This is also rendered more difficult by the tendency of the tubercles to undergo organization. When the tuberculous formation occurs near the surface of the choroid, the diagnosis is much easier than when it occurs in the center. The deeper tissues of the choroid, as a result of chronic irritation, undergo a sclerotic change. Cysts and amyloid-like bodies is also likely to be mistaken for the beginning of tubercle formation. The occurrence of three cases of cystic choroid is rather below the normal percentage. Cystic choroids during adult life are not at all infrequent. In the choroid in one case a diffuse colloid-like cystic condition was present; the material within the cystic areas stained pink by the Van Giesen method. The presence of a gelatinous exudate in the ventricles giving the same microchemical reaction led us to the assumption of a relation between the processes, which will be discussed under Ependymitis.

EPENDYMAL CHANGES.

(PSEUDO-GELATINOUS EXUDATE IN THE VENTRICLES OF THE BRAIN AND THE FORMATION OF THIS EXUDATE AND ITS RELATION TO VENOUS STASIS.)

The effect of the venous stasis in the production of nervous and mental disorders has not received the consideration it deserves. Much has been written on the subject of arterial disease, thrombosis, etc., of the central nervous system. The venous system

of the brain is as essential a part of the cerebral circulation as is the arterial. It is subject, especially in diseases of the respiratory system, to variations in pressure. When this increased pressure is continued over long periods of time, and especially in advanced cases which die slowly, the veins become so distended as to interfere with the free intracranial circulation. Capillary venous hemorrhages and gelatinous exudates in the ventricles are not infrequently found at the autopsy. Many symptoms could result from the interference with the cerebral circulation. Headaches, confusion, delirium, and other mental states might, at least in part, be so caused. In a disease like pulmonary tuberculosis, where so many and variable factors are at work, it is difficult to draw conclusions as to the production of symptoms resulting from functional disturbance of the brain. Gelatinous exudates in the cerebral ventricles occur in cases in which there is evidence of marked passive congestion with moderate distention of the ventricles. The relation of the gelatinous material in the ventricles to the venous stasis is probably not a simple one of cause and effect. There is more evidence of a close relation between the internal hydrocephalus and the exudate. In a case of sarcoma of the corpus callosum in my collection, involving the ependyma, and causing a proliferation of the ependymal and subependymal neuroglia, the third and fourth ventricles were filled with a homogeneous, gelatin-like material, which, when removed, presented a perfect cast of the distended third and fourth ventricles. In another case a papillomatous ependymoma, adenocarcinomatous in type, of the choroid plexus of a horse (University of Pennsylvania Medical Bulletin, November, 1904), a gelatinous exudate filled the lateral ventricles. In the discussion of this case I have there reported a firm, homogeneous mass filling the middle cerebral ventricle of the brain of an insane patient, with pathological changes in the ependyma lining the ventricle. There is a proliferation of the ependymal cells, distention of the subependymal veins, slight to marked peri-

vascular round-cell accumulation in the subependymal capillaries, and a proliferation of the neuroglia immediately beneath the ependyma. In the case of the horse, the choroid plexus was extensively diseased. That the same lesions may result from irritation of the ependyma with proliferation of the ependymal cells has been shown by the injection of irritating substances into the cerebral ventricles of the lower animals (*Journal of Experimental Medicine*, October 25, 1900). With the above facts, the question still remains open as to whether the ependymal changes are the result of some chemical change in the ventricular fluid, or whether the ventricular fluid becomes changed, with a tendency to coagulate on account of the change in the ependyma. In the six cases of this kind studied at the Henry Phipps Institute the ependymal changes were the same, but less intense than those found in the other conditions above described. In one case a hemorrhagic ependymitis with marked congestion of the ependyma was present. The lateral ventricles were filled with a gelatin-like mass; the ventricles were moderately distended, and the ependyma was very red with distended vessels and local hemorrhagic areas 1 mm. to 6 x 8 mm. in size scattered here and there over its surface. The relation of gelatinous exudates in the ventricle to disease of the cerebral vascular system is shown in a brain from a case at the Philadelphia Hospital. In this brain there is an extensive area of softening on the left side, affecting the distribution of the Sylvian artery. On the right side there is an extensive venous hemorrhage secondary to venous thrombosis affecting the optic thalamus and caudate nucleus. The ventricle of the left side is markedly distended; that of the right side is moderately so. In the right ventricle there is a gelatinous exudate filling the entire ventricle; mixed in with this there is a small quantity of free blood.

The gelatinous material in the tuberculous cases corresponded more closely to this case than to the others described, and for

that reason I am inclined to the opinion that there is a close relation between the venous stasis and the material in the ventricles.

The occurrence of a gelatinous material of the choroid plexus in one of the cases studied supports this view. I was at first inclined to consider the gelatinous exudate as an accidental occurrence. The frequency of the condition, together with the changes in the ependymal and subependymal tissues and choroid plexus, and the capillary hemorrhages in the cortex, pons, and medulla, show a distinct relation between the extreme passive congestion, the distention of the ventricles, and the gelatinous exudate.

The microscopic changes in the ependyma in both of these cases, and in cases where there was simple distention of the ventricles without exudate, gave the following result. There constantly is a more or less edematous condition of the subependymal neuroglia; in marked cases the neuroglia occurs in wavy bands closely placed together, and in areas it is proliferated to such an extent as to form distinct nodules extending into the ventricles. The layer of ependymal cells undergoes proliferation in the neighborhood of these areas, and is very frequently absent from the areas of gliosis. Special care was used in the embedding and sectioning of the tissues to secure uniform results. The ependymal layer is so delicate that it is easily detached in the technique of mounting and sectioning. The absence of the ependymal layer from the areas of gliosis is, however, constant. The fine granular exudate which is not infrequently found in the ventricles contains cell-elements which resemble in their morphologic and staining properties the ependymal cells. It is probable that an exfoliation of the ependyma takes place in these areas.

While capillary hemorrhages in most cases may be considered to be agonal in type, the presence of degenerated blood-pigment and siderophil cells in some of the cases is evidence of

the existence of the hemorrhages some time before death. In one of the cases of moderate internal hydrocephalus with extensive gelatinous exudate in both lateral ventricles there was present an extensive hemorrhagic ependymitis. The ependyma was very markedly congested throughout, and here and there were seen extensive bright red areas which, on microscopic examination, seemed to be composed of infiltrated red blood-corpuscles.

HYDROCEPHALUS.

Number of brains examined,.....	78
Number of cases of internal hydrocephalus,.....	26

In six of these cases the distention of the ventricles was marked, leaving no doubt of the pathological condition. The other cases showed a slight to moderate distention, which may come within the pale of normal structure. In most of these cases, however, the distention was more than would naturally be expected from the type of brain under consideration. In the consideration of organic nervous diseases a moderate distention of the ventricles is often met, and is not considered, as a rule, pathological or excessive. In cases of cerebral thrombosis of long standing, even when comparatively slight, there is usually found an associated distention of the corresponding lateral ventricles. In organic conditions of the brain associated with wasting, whether local or general, the distention of the ventricles is rather the rule than the exception. This is true of general paralysis of the insane and Huntingdon's chorea. In the absence, therefore, of any definite standard as to what constitutes distinct hydrocephalus we can only state that in cases of advanced pulmonary tuberculosis a moderate or advanced stage of distention of the ventricles is often present. The relation of the distention of the ventricles to passive congestion or sclerotic and other pathological changes in the choroids

and the ependyma is not definite. The most marked changes in the ependyma are seen in the cases of great distention of the ventricles.

AFFECTIONS OF THE SPINE, THE SPINAL CORD, AND ITS MENINGES. TUBERCULOUS ARTHRITIS.

Tuberculous arthritis does not come within the scope of a report of the nervous manifestations of tuberculosis except in so far as it affects the spinal column. In a consideration of this subject it will be necessary to consider the general arthritic manifestations of tuberculosis. Apart from an active tuberculosis of the joints associated with necrosis and destruction, there are two other forms of joint manifestations. The more common of these is a multiple arthritis following the clinical picture of acute inflammatory rheumatism. This complicates, as a rule, advanced cases of pulmonary tuberculosis, and runs a longer course than articular rheumatism.

The majority of cases run a subacute course, without swelling and with comparatively little pain. Some of the cases run an acute course, with high fever, and do not differ in the clinical picture from the same class of cases of acute articular rheumatism. A comparatively large group of cases present a painful, swollen, and tender condition of the joints of the fingers, without involvement of any of the larger joints. It is not infrequent to find this process confined to a single large joint. In some cases the process may go on to a partial or complete ankylosis without acute pain or swelling. Partial loss of power in such a case, with pain on free movement, was diagnosed as a case of neuritic paralysis on account of the inability to use the arm. The examination showed a complete ankylosis with tenderness of the shoulder-joint. There was no real loss of power in the individual muscle groups tested, no disturbance of sensation with the exception of tenderness about

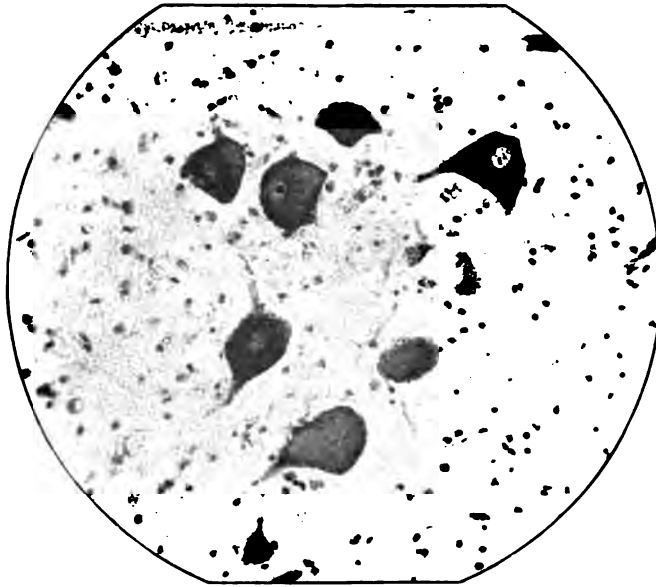


FIG. 5.—Anterior horn cells of the spinal cord, stained by the Nissl method, from the case of Landry's paralysis. All of the cells are in an advanced stage of degeneration. In one of the cells the chromophilic granules are present. In the other cells the nucleus, when present, is displaced to the periphery. In the upper cell at the right, the nucleolus is outside the nucleus.



FIG. 6.—Sections of muscles showing fine granular degeneration by the Marchi method. A. Cross-section. B. Long section with the striations retained. C. Advanced degeneration with the striations lost.

the joint, no loss of reflex action, and no degenerative change in the muscles.

A careful study of a large number of cases grouped under the clinical classification of rheumatoid arthritis will show a small number associated with lymphatic or pulmonary tuberculosis. The general manifestations do not differ either in their morphology or in the clinical course from cases of rheumatoid arthritis in non-tuberculous subjects. These patients react to the tuberculin test, and the febrile rise following the injection of the tuberculin is sometimes associated with a swollen, painful condition of the affected joints and of the lymphatic glands. Three cases have come under observation with a rigid condition of the spine and were diagnosed as rheumatoid arthritis. In one case the entire spine was rigid, with minor manifestations in the knee-joints. In the other two cases the dorsal and lumbar spine was rigid, the cervical spine retaining a slight degree of motility. In the first case zonal hyperesthesia was present on the trunk, and in the second case marked hyperesthesia of spinal origin was present in both lower extremities.

In one case of moderately advanced pulmonary tuberculosis of a fibroid type an acute kyphotic protuberance was present in the lower dorsal spine, with complete rigidity of both the dorsal and the lumbar spine. This case is evidently one of an old healed Pott's disease in association with a more chronic proliferative tuberculous process of the other spinal articulations.

SPINAL CORD. SPINAL MENINGEAL INVOLVEMENT.

Number of spinal cords examined,.....	32
Number of cords showing lesions,	5

In two of the cases of tuberculous meningitis an inflammatory condition of the cord with miliary tubercles was present. In one case (No. 2602) an aberrant type of tuberculosis of the meninges was present. A recent miliary tuberculosis had

affected the meninges of both the brain and spinal cord; to this was added a marked plastic condition of the same meninges. The microscopic picture of the meninges of both the brain and spinal cord resembles, for the most part, that seen in the meningomyelitis of cerebrospinal syphilis. There was a marked round-cell infiltration composed of small round-cells profuse throughout the meninges and extending into the spinal cord. This was associated with a proliferation of the fixed connective-tissue cells and of the endothelial cells of the membrane. This led to a marked thickening of the meninges of the spinal cord and to a lesser degree of the base of the brain. There was a plastic exudate of moderate grade over the base of the frontal lobe and the mesial surface of both hemispheres. This was at first mistaken for the subacute leptomeningeal change already described. Around the blood-vessels, near the anterior spinal fissure, a gelatinous exudate similar to that seen in the ventricles was present. This exudate was present also over the motor cortex. The meningeal process was most intense over the dorsal cord, as in cerebrospinal syphilis. A fungoid, soft, friable mass the size of a split-pea was present over the posterior roots of the twelfth dorsal segment. This was composed of a reticulum of fibrin containing, here and there, isolated nuclei. There was also diffuse degeneration of the spinal cord, such as is seen in syphilis. The blood-vessels, however, showed no pathological change other than the diffuse round-cell infiltration above referred to. The fungoid mass above described I have seen in another case of multiple tuberculosis which also presented the clinical manifestations of cerebrospinal syphilis.

GANGLION-CELL DEGENERATION OF TOXIC ORIGIN.

Minor grades of degeneration of the ganglion-cells of the anterior gray horns of the spinal cord are not infrequently seen in the routine sections of our autopsies. Frequently it is of no

clinical significance; in other cases it represents the pathological basis for loss of muscular power. The terminal paralyses occurring a short time before death may be due to changes in the peripheral nerves, or may sometimes be of spinal origin.

In the latter group, the paralysis is of an ascending type. It begins with a loss of power, and goes on to complete paralysis of the muscles of the foot and lower leg, and ascends to the trunk. There is usually no disturbance of sensation, the reflexes are lost, and there is no tenderness over the nerves. It is difficult to differentiate this group from that due to parenchymatous neuritis. In parenchymatous neuritis the restriction of the paralysis to the distribution of one nerve, with a disturbance of sensation localized to a definite area, and the absence of any tendency of the paralysis to spread, will make the diagnosis.

The presence of extensive cell-degeneration of toxic origin in the case about to be described throws some light upon the nature of the group of paralyses of spinal origin. Before taking up this case we shall consider the different types of paralysis from which paralysis of spinal origin is to be differentiated. The clinical picture of the case was that of Landry's paralysis. This is a peripheral type of paralysis, and due to a wide-spread degeneration of the ganglion-cells of the anterior horns. The paralyses due to tuberculosis of the nervous system may be grouped as follows:

A. Those caused by a parenchymatous neuritis, in which the nerve-fibers become degenerated without evidence of a true inflammatory process in the nerves.

B. Inflammatory interstitial neuritis, in which all the symptoms and pathological manifestations of an acute inflammatory process are presented.

C. A complex group, occurring immediately before death, in which the paralysis had first presented the clinical characteristics of a parenchymatous neuritis, but in which there is a

tendency to involvement of successive groups of muscles, giving an ascending type and probably due to toxic involvement of both the peripheral nerves and the spinal cord.

D. Pressure paralysis, usually involving the peroneal nerve as it curves round the head of the fibula, and subject, at that point, to pressure when the patient remains for a long time in one position, resting on the external surface of the leg.

The paralysis due to involvement of the central nervous system may be divided as follows:

A. Those due to acute inflammatory processes of the meninges, such as tuberculous cerebral or spinal meningitis.

B. Hemorrhagic encephalitis secondary to meningitis or independent of it.

C. Paralysis of cerebral origin secondary to infiltrating or encapsulated tuberculous lesions.

D. Paralysis of cerebral origin due to localized areas of softening, secondary to local infiltrating processes of the meninges cutting off the cortical circulation.

E. Paralysis of spinal origin from tuberculous tumors of the spinal cord.

F. Paralysis due to internal or external pachymeningitis, secondary to Pott's disease. The paralysis is due partly to an inflammatory infiltration and partly to pressure.

G. Paralysis due to tuberculous myelitis which may be diffuse and infiltrating in type, or localized to one or more segments. It may be secondary to obstruction of the circulation of these segments by active arterial disease.

H. Paralysis due to wide-spread toxic degeneration of the ganglion-cells of the anterior horns of the spinal cord (Landry's paralysis).

Differentiation of these groups of paralysis depends upon a careful study of the symptoms present in the individual case. The scope of this study is too limited to consider the differential diagnosis of all the above types of paralysis. It will be neces-

sary, therefore, to limit this paper to a consideration of the last group above presented.

As a type of this group, a case of Landry's paralysis with autopsy and microscopic examination of the central nervous system will be presented. Landry's paralysis or acute ascending-paralysis was first described by Landry in 1859. He described it as a purely motor type of paralysis, without sensory involvement. The microscopic examination had at first given entirely negative results, but with the development of finer methods for the study of the degeneration of the nerve-cells, distinct and typical lesions have been found. These are entirely confined to the motor cells of the anterior horn and to the motor nuclei of the medulla and pons. More or less confusion has been added to this subject by a tendency to consider all types of paralysis which ascend as examples of Landry's paralysis. As a result of this, many cases are on record as cases of Landry's paralysis in which there have been present lesions of the peripheral nerves, which should have been described as cases of peripheral neuritis. There are also recorded as Landry's paralysis cases presenting inflammatory lesions of the gray and white matter of the spinal cord—evidently cases of myelitis. In both groups of cases symptoms other than those of a purely motor type of paralysis were probably present, but overlooked.

The clinical picture of Landry's paralysis is distinctive. The paralysis is always motor in type, without objective disturbance of sensation; with retention of bladder and rectal control; with loss of reflexes in the distribution of the paralyzed parts; and with retention of consciousness to the termination of the disease. It is, as a rule, an afebrile condition, running a rapid course and terminating in most cases after several days by involvement of the vital nuclei of the medulla. The paralysis is not necessarily always of an ascending type, but may begin in the arm and descend; or it may ascend to the medulla and terminate fatally. The disease is not, however, necessarily a

fatal one, and cases sometimes recover. Of the six cases that have come under my observation, only one has recovered. This perhaps is even too high a percentage of recovery. The disease is a rare one, even in neurological practice, and a case complicating pulmonary tuberculosis becomes, therefore, of special interest. The cause of Landry's paralysis has never been determined, but in all probability different etiological factors are present in different cases presenting the same clinical picture. Landry's opinion that he was dealing with a form of obscure intoxication is still worthy of consideration. That a toxic-infectious process is probably the cause in most cases is supported by the occurrence of enlargement of the spleen and lymph-glands, with hemorrhagic foci in the lungs and intestine, and albuminuria in various cases. Baumgarten found an anthrax infection in one case, with the presence of anthrax bacilli in the blood and tissues. Curschmann recorded a case in which typhoid bacilli were obtained in pure culture from the spinal cord. Eisenlohr found, in a case evidently due to mixed infection, staphylococci in the central nervous system. Remmlinger reports a streptococcus infection in a case; Marinesco found a diplococcus. Seitz also found a diplococcus which he identified as the Fränkel-Weichselbaum diplococcus of cerebrospinal meningitis.

In the case here reported the Klebs-Löffler bacillus was found in the lungs as a mixed infection. It could not be found, however, in the fixed sections of the spinal cord. No attempt was made to isolate it from the fresh material. The case is as follows:

Case No. 2957. White. Single. American. Salesman by occupation. Was admitted to the service of Dr. Joseph Walsh 12—5—'04. His mother had died of tuberculosis in 1899.

The patient had never been ill until four years before admission, when he had pleurisy. Pulmonary symptoms had been present since that time. He had been much worse for the last six weeks, with a severe cough, profuse expectoration, night-sweats, and dyspnea after exertion.

He was five feet five inches in height, and weighed one hundred and

forty pounds eight years before; his average weight had been one hundred and thirty-two pounds; his lowest recent weight had been ninety-eight pounds four years before, after which he had gone up to a hundred and thirty-two pounds, and, more recently, had receded to one hundred and fifteen pounds. His weight on admission was one hundred and one and three-quarter pounds.

Condition on admission: The tongue was coated, the throat congested, the pupils unequal and slightly dilated—the left more so than the right—and sluggish in reaction to light, but prompt to distance. His general appearance was very good—he was neither pale, hectic, nor cyanosed; there was no emaciation, no depression above the clavicle, and no winging of the scapulæ. The chest expansion was recorded as “two inches by measurement.” The spleen was not palpable; the thyroid was normal.

The examination of the heart showed the apex-beat to be in the fifth interspace at the nipple-line, the upper border at the third rib, and the right border at the middle of the sternum. The second sound was accentuated, but there were no murmurs.

The examination of the sputum showed the presence of tubercle bacilli. The examination of the urine showed it to be acid, with a specific gravity of 1025, with a negative reaction to the tests for albumin, sugar, and diazo. There were a few red blood-corpuscles found upon microscopic examination.

Physical examination of lungs: Right chest: impairment above and below the clavicle; impairment to midscapula posteriorly, with] hyperresonance below the angle of the scapula; inspiration slightly roughened; expiration prolonged everywhere. Left chest: Dulness above and below the clavicle; tympany below to the second interspace; hyperresonance to the sixth rib, and then dulness. This lower area of dulness was movable. Dulness was present to the midscapular region posteriorly and below the eighth rib. Hyperresonance existed between these areas. Cavernal breathing with whispering pectoriloquy was elicited above the second rib anteriorly and posteriorly. Moist rales were noted everywhere.

He improved gradually and began to leave his bed about Christmas, 1904. His weight increased gradually, and on 1-26-'05 he weighed one hundred and fourteen and one-half pounds. Examination made on 1-29-'05 showed the same involvement as above noted. Diagnosis at this time was: Infiltration left upper lobe with cavity; infiltration of upper part of right upper lobe; small effusion at base of left lung.

Nervous examination: There is no nervous disease or insanity in the family. The patient has had no previous nervous disease, was educated for college, is of hopeful mental attitude, good memory, and has had no delusions. Since admission he has slept poorly.

On Thursday, 1-26-'05, he complains of numbness in the fingers of both hands, with loss of power in the hands and arms, and at the same time has some difficulty in walking, due to loss of power in the legs. On the twenty-eighth there is little numbness, but the loss of power is greater; he can hardly lift his arm, and there is marked toe-drop.

On the twenty-ninth he is unable to lift his legs sufficiently to get out of bed, and there is a very marked loss of power in both hands and arms. There is some slight muscular action retained in the left biceps and deltoid. He complains to-day that his tongue feels heavy, that he is unable to articulate properly. The palate and pharyngeal reflexes are normal. Sensation for touch, pain, and temperature stimuli are preserved over the entire body. There is no pain, and there had been none since the beginning of the trouble. There is some slight difficulty in deglutition. The cranial nerves to objective examination, with the exception of a fibrillary tremor and some slowness of action of the tongue, are normal. The pupils are equal and react to light and accommodation promptly. The left palpebral fissure is narrower than the right. On extreme outward excursion of either eye jerky nystagmoid movements are observed.

Reflexes: The plantar reflexes, the tendo Achillis reflexes, the knee-jerks, and the superficial skin reflexes are absent. There is a slight biceps jerk on the left side. The other reflexes of the upper extremities are absent.

On 1-30-'05 the condition remained the same, with the exception that the patient seemed to be weaker and had some difficulty in swallowing both solid and liquid food, and getting up his expectoration. There was some loss of power for movements of the head. January 31st there was little change with the exception of the gradual progress of the difficulty in swallowing and occasional choking spells. Death ensued from respiratory failure on 2-5-'05.

The electrical examination revealed a loss of reaction of the muscles of the lower extremities to the faradic current. Muscular reaction to galvanic current in the muscles below the knee was distinctly slowed. $AnCIC > KCIC$; the muscles of the thigh, $KCIC > AnCIC$. This was also true of the upper extremities. The course of the nervous symptoms with the absence of pain or tenderness over the muscles or nerves, or of other sensory changes in the rest of the body, made the diagnosis of Landry's paralysis.

Gross examination of the brain: There was considerable subarachnoid edema restricted to the frontal and motor areas. This is a condition found in the large majority of cases of tuberculosis. There was a moderate grade of internal hydrocephalus. The ventricular fluid was clear. The brain and spinal cord were otherwise normal.

The peripheral nerves were removed and carefully studied after the autopsy by the fresh osmic-acid method. (The fresh nerves were teased, placed in a 1% solution of osmic acid for twenty-four hours, and then teased in glycerin, so that the individual fibers could be examined.) The following nerves were examined: The ulnar, median, anterior and posterior tibial, sciatic, vagus, phrenic, sympathetic, and splanchnic. These nerves were perfectly normal to microscopic examination. The fresh osmic-acid method above described, the most delicate method for detecting degenerative changes in the peripheral nerves, gave entirely negative results in all these nerves. This was most surprising, in view of the degenerative electrical reaction noted in some of the muscles. The spinal cord was studied by the hematoxylin-eosin, van Giesen, iron-hematoxylin, Wiegert, and especially by the Nissl method. Serial sections through the medulla and pons were made and stained by these methods. Sections from the different segments of the spinal cord were also made and studied.

The white substance of the spinal cord was entirely normal to the sheath methods and the usual nuclear stains. There were no changes in the meninges. The changes noted by the hematoxylin-eosin method were confined entirely to the gray matter. All the ganglion-cells were more or less degenerated and presented a hyaline pink appearance. Many of them were shriveled and contracted, and only a very few of them presented a nucleus. Many of the cells contained large quantities of yellow pigment. The blood-vessels were normal, as were also the meninges and the white matter. The spinal canal was patulous, even through the lumbar enlargement. The same microscopic picture was seen throughout the entire spinal cord and medulla.

The van Giesen method presented the same changes as above noted.

The axis-cylinder within the gray matter of the anterior horn and extending into the anterior roots presented a swollen appearance. The anterior roots themselves, however, presented no such change.

Nissl method: Practically all the cells of all the sections examined, taken from each segment of the spinal cord, presented marked degenerative changes. It was exceptional to find a cell approaching the normal condition. The nucleus was retained in less than one-fourth the number of cells. In these cells it was displaced toward the periphery, shrunken in appearance, and without its chromatin network. All the cells had a swollen, vesicular appearance, and those showing the most degeneration stained a pale blue without any chromophilic elements at all. In some of the cells a single row of chromophilic elements were present at the extreme periphery of the cell. Those few cells in which the chromophilic elements were retained were in a condition of pyknosis. The cells in the nucleus of the twelfth nerve presented

the same changes as those seen in the spinal cord. The cells in the olivary body presented a comparatively slight degenerative change. The same may be said of the sensory nuclei. The cells of the tenth nucleus and the nucleus ambiguus show marked degeneration, but there was a larger proportion of the cells approaching the normal type than in the twelfth nucleus. The cells of the nucleus of the seventh nerve were practically normal, with the exception of a few which were in a condition of pyknosis. The nuclei above this level showed no pathological change. The cells of the cortex of the motor and frontal areas were slightly pigmented, but were otherwise normal. The cerebral tissues, by the other methods, showed no pathological change.

The lesions in this case were, therefore, entirely confined to the motor ganglion-cells of the spinal cord and medulla. The peripheral nerves were entirely normal. The cerebral cortex was normal. The lesions, therefore, correspond to the clinical picture and establish the clinical diagnosis of Landry's paralysis.

The only other diagnosis to be seriously considered in this case is that of multiple neuritis. The absence of pain, the absence of tenderness along the nerves, the retention of all forms of sensation to a normal degree, exclude this diagnosis. An infiltrating lesion high up in the spinal cord could produce paralysis of all four extremities, but under such circumstances we would expect the reflexes increased rather than lost, with disturbance of the bladder and rectal function. The loss of reflexes following the progress of paralysis localized the lesion to the peripheral neuron—that is, somewhere between the anterior horn ganglion-cell and the periphery.

The pathological examination does not establish definitely the cause of the cell-degeneration. The bacteriological examination showed the presence of the diphtheria bacillus. Cultures taken from the lungs showed staphylococcus pyogenes aureus and albus, yeast, and diphtheria. The diphtheria bacillus here obtained was not virulent for guinea-pigs. It is possible that any of these factors, or a combination of them, might, with the tubercle bacillus, furnish the intoxication necessary to cause the cell-degeneration. It was unfortunate that a culture from the spinal fluid was not obtained during the life of the patient. Of the organisms noted above in this case, the diphtheria bacillus is by far the most potent in its effects upon the nervous tissue. The effects of the toxin of this organism on the peripheral nerves and the ganglion-cells have long since been established, both clinically and experimentally. It is probable, therefore, that the mixed infection with this organism was the material factor in the production of the nervous symptoms.

TUBERCULOUS NEURITIS.

Number of brains examined,	112
Number of cases studied,	5

The subject of neuritis complicating pulmonary tuberculosis was considered in full in the first annual report. Six cases were there reported, four of the parenchymatous type, two of the interstitial type. The consideration of paralysis of toxic origin was considered under the previous heading (Ganglion-cell Degeneration of Toxic Origin). Many cases which at first appeared to be of a parenchymatous nature were afterward found to be due to spinal ganglion-cell involvement. This is especially true of the terminal cases. The main points of differentiation are the ascending types of spinal paralysis of toxic origin, the lack of sensory disturbance, the absence of pain or tenderness over the nerves.

Tenderness over the bones should not be mistaken for tenderness over the muscles or nerves. Pains in the extremities, worse at night and accentuated by the pressure of bed-clothes, are not infrequently traceable to periosteal tenderness. This tenderness may be localized to the bones of the extremities, especially to the fibula, or it may also affect the bones of the upper extremities, and not infrequently the flat bones of the chest. The study of the periosteum and the bone-marrow is now under way, and may offer some explanation of this phenomenon. Little has been added to the gross and microscopic pathology of the different forms of neuritis described in last year's report.

MUSCULAR SYSTEM.

A careful study of the muscles removed at autopsy was made in forty-two cases. This study was carried out in the following manner: The muscles of the anterior and posterior portion of the leg were removed routinely at all autopsies; when, for any

reason, a pathological condition of the muscles of the lower extremities was to be expected, portions of the biceps and triceps muscles of the upper extremities and of the pectoral muscles were also removed. The necessity for the removal of the anterior tibial nerves and in some cases of the anterior tibial artery led to the following technique, which, on account of its simplicity, deserves description. An incision from two to three inches in length is made along the outer surface of the leg along the anterior edge of the fibula. A long knife is then inserted along the anterior surface of the tibia, and the tissues severed longitudinally. A transverse cut is then made at the upper and lower end of the incision, and the tissues removed. In this way the anterior tibial and common extensor muscles and the anterior tibial artery and nerve are removed at one time. This technique obviates the necessity of a prolonged and tedious search for the anterior tibial nerve. A portion of the nerve is examined by the fresh osmic-acid method, and a portion is placed in Müller's fluid for subsequent examination by the Marchi method. The remainder of the nerve is left attached to the muscle, which is placed in Müller-formol (Orth's) solution. During the first year particular attention was directed to changes obtained by the Marchi method.

This report includes the study of the muscles of forty-two cases. A study of the teased, fresh muscular fibers gave negative results. Immersion of these fresh fibers in a 1% solution of osmic acid was likewise negative. By the Marchi method the muscular tissue, which has remained in Müller's fluid for at least ten days, is cut into small blocks and placed in equal parts of 1% osmic acid and Müller's fluid for four days. It is then embedded in celloidin and sectioned. Sections were also stained by the hematoxylin-eosin and van Giesen methods. The findings may be classified into—

- A. Those showing lesions by the Marchi method.
- B. Those showing lesions by the hematoxylin-eosin and van Giesen methods.

In only two of the forty-two cases was there an associated neuritis (Nos. 1994 and 1601). While the nerves in both cases showed most extensive degeneration by the Marchi method, there was no change noted, by this method, in the muscular fibers, *i. e.*, no degenerative change into fatty material. In the nerves from nine cases isolated and scattered black granules were found. The nerve is considered to be in a state of degeneration only when the fatty degeneration of the myelin has reached such a stage that these black granules are numerous and arranged in beaded formation along the course of the nerve. The most that can be stated of the scattered black isolated granules is that they represent a nutritive change in the myelin within the pale of normal structure. In two of the cases the nuclei at the nodes of Ranvier take a black stain with the osmic acid, without, however, a distinct degeneration in the myelin. The significance of this is not exactly clear, but may represent the absorption of fatty material either from the myelin or from the interstitial muscular fat.

GRANULAR FATTY DEGENERATION OF MUSCULAR FIBERS.

In ten of the forty-two cases these changes were present. They were marked in six cases and slight in four. The microscopic picture shows a swollen condition of the muscular fibers, with loss of transverse striation, and the presence, by the Marchi method, of large numbers of minute, fine, pin-point black granules situated closely together, and filling up the entire muscular fiber. In one case (No. 2360) a few coarse black granules were present among these finer pin-point granules. In these specimens the muscular fibers were atrophied and tortuous, with an increase in number of muscular nuclei. These, perhaps, were only relative, on account of the atrophied condition of the fibers. Fragmentation was present in four cases. A swollen, edematous condition of the muscular fibers was present in four cases. A study of the muscle shows, in certain diseases, a transformation of

muscle tissue into coarse fat-granules. This is typically seen in fatty degeneration of the heart. It would be expected in the acute degeneration of muscles following nerve section. In an experimental study of sections of nerves, and a study of the muscles, no such degeneration was found. A swollen condition of the muscle-fibers is presented, which later goes on to a tortuosity and atrophy, but at no time is there any change in the muscle-fibers when stained by the Marchi method. We must conclude, therefore, that the fine granular fatty degeneration noted in the above cases of pulmonary tuberculosis is not dependent solely on the disturbance of the nerve-supply. The marked loss of muscular substance in robust individuals in advancing pulmonary tuberculosis and other wasting disease could best be explained by the transformation and use of a proteid material of the muscle for food uses in the economy. The minute fat-granules in the muscles may represent an intermediate stage of transformation.

CHANGES IN THE INTRAMUSCULAR ADIPOSE TISSUE.

In connection with the above study of changes in the muscular tissue, particular attention was paid to the changes in the intramuscular fat. In a case dying from pneumonia or other complication with a fair retention of fat and muscle, large quantities of fat in large globules may be seen between the muscle-fibers. In advanced stages of wasting this fat, gradually disappearing, is last seen in both large and minute black granules in the immediate neighborhood of the blood-vessels, and often as a single row of fine granules along their course. In areas of rapidly disappearing fat masses of amorphous black granular material remain in the interstitial tissue in sections stained by the Marchi method. The histological structure of normal adipose tissue differs somewhat from the tissue under consideration. The normal adipose tissue consists of a series of fat-cells which are unilocular. In areas of disappearing fat an appar-

ently reticular structure is seen in the fat-cells. The globular appearance of the cells is lost, and delicate black threads are seen connecting with each other through the cell-substance. This may be a true reticulum, or it may possibly represent a wrinkling of the surface of the shrinking cells. Some of the cells present the appearance of the compound granular cells seen in the neighborhood of the foci of degeneration of nervous tissue.

FUNCTIONAL DISTURBANCES OF THE NERVOUS SYSTEM IN TUBERCULOSIS. MENTAL ATTITUDE.

The further study of the mental attitude of the advanced cases in the house and the mixed cases in the dispensary does not support the conclusions arrived at in the first annual report. In that report the mental attitude of 52% of the cases was considered hopeless or in doubt as to a successful termination of the disease. Even in hopeful cases, however, a record of depression is frequent. It is quite reasonable to expect a patient suffering from such a serious condition to manifest a persistent mental depression, even if there is a reasonable hope for cure. Tuberculous patients so often reflect the mental attitude of the physician that the change in statistics in this year's report as compared with the previous year may to some degree be explained in this way.

The determination of the mental attitude is often made difficult by the change of disposition manifested in most cases after the disease has well developed. Irritability, tendency to discontentment with the immediate surroundings, all of which are more or less accentuated by a certain amount of worry in relation to family and other matters, complicate the determination of the mental attitude in such a way as to make many of the records of little value. The memory was found deficient in twenty-four cases, which is, perhaps, below the proper ratio in well-developed cases. Slight failure is present in a

large number of advanced cases, and it is not uncommon to find a very decided failure in many cases.

INSANE STATES IN TUBERCULOSIS.

Number of patients upon which table is based,.....885

Number of patients showing mental disturbance,..... 20

It is difficult to state what percentage of these twenty patients showing varying forms of mental disturbances should be classified as distinctly insane. All the twenty occurred in advanced cases of tuberculosis.

The first case recorded during the year, No. 1994, is undoubtedly one of delusional insanity, with more or less confusion. Until the physical condition became very markedly weakened, he showed considerable excitation and threatened the nurses and others about him. His delusions varied from time to time, but were systematized while they existed.

Case No. 2149 had rather active delirium, especially marked at night and sometimes during the day.

Case No. 2271 presented no delusions, but had marked depression, some confusion, and prolonged fits of mental depression in which he refused to reply to questions.

Case No. 1742 was a well developed case of paranoia with systematized delusions of persecution.

Case No. 2181 was a case of tuberculous pseudoparesis (see First Annual Report), with delusions of grandeur, marked failure of memory, exaggerated reflexes, parietic speech, and confused delirium at times.

Case No. 2596 was also a case of tuberculous pseudoparesis, with general symptoms the same as those of the case No. 2181. In addition, he used vile language and was of a very quarrelsome disposition. He manifested childishness by a desire for toys, playing with boxes of stationery, etc. He was, in addition, of a criminal type.

Case No. 3010 had marked deficiency of memory, no delusions, and frequently refused to take food because, as he stated, he had just taken that particular meal.

Case No. 2041 was one of chronic alcoholism, with associated cardiac and liver disease. For a long time he was suspicious of the speech and actions of every one about him, which almost amounted to delusions of persecution.

Case No. 2676 died during the present year; cortical and subcortical hemorrhagic softening affecting the frontal area was found. The pathological lesions and mental symptoms in this case will be found detailed under Chronic Tuberculous Meningo-encephalitis.

Case No. 3142 had marked depression associated with hysteria. This, in all probability, was due to nostalgia. There was an associated neuritis of the left peroneal nerve.

Case No. 2356 developed delirium tremens shortly after admission.

Case No. 2295 had marked somnolence, confusion, and changing delusions.

Case No. 2796 had marked failure of memory. He deliberately soiled the bed-clothes; he would call for the urinal, then deliberately urinate in bed, and state that he did not know what he had done. He was a very advanced case of pulmonary tuberculosis with marked weakness.

Case No. 2564 was one of senile confusion with delusions of persecution. In this case the diagnosis was doubtful as to tuberculosis.

Case No. 2768 had loss of memory, mental abstraction, and hallucinations of sight. He stated that he took his meals, dressed, etc., in response to certain signs on the wall.

Case No. 2800 was always eccentric. He was the black sheep of a respectable family. His eccentricity had become accentuated since the tuberculosis developed; it culminated in terminal delirium, with hallucinations of sight.

Case No. 1931, female, was very quarrelsome as a result of marked suspicion that every one was talking about her. She had no distinct delusions of persecution, however.

Case No. 2477 had marked depression and some confusion. She talked to herself most of the time, and when asked about it, stated that it was not she, but the ghost of the patient in the next bed.

Case No. 1577 was a very chronic case in the advanced stages of tubercu-

losis with associated amyloid disease. She presented hallucinations of sight, marked irritability, confusion, etc.

Case No. 2139 was one of tuberculous pseudoparesis; she was very happy and contented, with expansive ideas, a paretic speech, increased reflex excitability, and marked tremor.

The frequency of mental phenomena in advanced cases of tuberculosis is seen from the above résumé. Terminal delirium is, of course, not included. The loss of memory and the lowered general physical tone are responsible for the confusion noted in many cases. This, associated with a marked degree of suspicion as to the motives of others, is perhaps the most frequent mental phenomenon. Two groups of cases are thus explained: the confusional type of mental disturbance as a result of marked loss of memory and lowered mental tone in association with marked bodily weakness; and the simple delusional type, with a tendency to persecutory ideas as an advanced stage of suspicion associated with irritability. This latter group of cases should be distinguished from paranoia with systematized delusions of persecution, which may occur as a complication in even incipient cases, and which is not dependent, to the same degree, on a loss of physical vigor.

Case No. 1994 showed no mental disturbance or other variation from the normal until in an advanced stage of pulmonary tuberculosis. His systematized delusions with personal exaltation were not persistent, and disappeared after several days, to give place to equally complex delusions of an entirely different kind. There is a group of cases of mental disturbance complicating tuberculosis of which this changing type of delusion is more or less characteristic.

In the first annual report tuberculous pseudoparesis was first described as a distinct type of mental disturbance complicating pulmonary tuberculosis. A marked cerebral atrophy, as not infrequently seen, would lead us to expect this form of mental disturbance. Of the twenty cases of mental

disturbance here reported, three were of this type. This type occurs in advanced cases of pulmonary tuberculosis in which there is evidence of marked toxemia. Expansive ideas with delusions of grandeur and a feeling of well-being in marked contrast to the physical condition, childishness, marked tremor, exaggerated reflexes, and disturbance of speech present a clinical picture sufficiently resembling that seen in general paralysis of the insane to be striking. Here, again, there is no difficulty in recognizing a certain distinct difference both in the development and in the clinical picture itself. The mental manifestations are probably an overdevelopment of a certain hopeful mental attitude frequently seen; the tremulous parietic type of speech, an accentuation of the tuberculous tremor associated with loss of memory and of muscular vigor; the childishness and deterioration of mental tone, an advanced stage of loss of memory seen at times in early and more frequently in advanced cases.

There is, perhaps, a larger number of cases of mental disturbance complicating pulmonary tuberculosis, with pathological lesions, which may have had more or less to do with the disturbance of cerebral function, than other forms of insanity. The disturbance of the cerebral circulation, to which attention has already been called as a result of dyspnea, atrophy of the cortical convolutions, local meningeal exudates, inflammatory states of the meninges, internal and external hydrocephalus, and focal cerebral lesions, are at times found in these cases. In case No. 2676, for example, the wide-spread cortical and subcortical lesions in the prefrontal lobe of the right side might easily have produced the mental disturbance presented. The term "pathological basis" is not meant to imply, however, a distinct causal relationship, but is simply used in a general way to indicate the basis for disturbance of function. The report of the mental disturbance in one hundred and seventy-three cases studied in the dispensary will be reported by Dr. Carncross.

TREMOR.

Tremor of the hands is of frequent occurrence. It is present in all the house cases examined, and in seventy-one of the one hundred and seventy-three dispensary cases. The tremor, as a rule, is a fine rhythmic movement of the fingers, and can easily be brought out by holding the hands and fingers in marked extension. A study of the dynamometer records and temperature-charts shows that this tremor is independent of loss of muscular strength and fever reaction. It is found present when the dynamometer record is normal, and in some cases above normal. In dying cases, tremors are to be expected. In such cases they are often of a coarse, intention type. In rare cases they follow the pill-rolling type of paralysis agitans. The coarse intention tremor resembles that seen in multiple sclerosis, and is sometimes seen in early cases. A tremor of the toes was noted in one case.

REFLEXES IN TUBERCULOSIS.

The tendon reflex in tuberculosis was considered in full in the first annual report. Little has been added to the subject as there presented. The study of the dispensary patients gives practically the same results as to the general condition of quickened reflexes as was found in the advanced cases presented in the first year's work.

The Babinski reflex, considered as a valuable diagnostic sign of disease of the central motor nervous mechanism, has been found in four cases within the past year. It was found in the same number of cases during the preceding year. In all four cases there was no organic disease of the central motor tracts. The ulnar reflex is a very frequent manifestation of toxic irritation of the reflex mechanism. It was present in fourteen out of fifteen advanced cases, and, according to Dr. Carn-

cross' records, in seventy-one of the one hundred and seventy-three dispensary cases examined. A careful study of control cases during the past year has shown that this reflex is of rare occurrence outside of pulmonary tuberculosis.

In nine cases the reflexes were markedly exaggerated, in two cases they were diminished, and in one case they were entirely absent. In the three latter cases a marked asthenic condition was present.

SYMPATHETIC SYSTEM.

Note was made in the first annual report, among derangements of the sympathetic system, of a group of symptoms identical with that seen in the early cases of exophthalmic goiter. Twelve cases of the two hundred and eighty-seven patients examined showed this symptom-group. The analysis of the constituent elements, *i. e.*, exophthalmos, retraction of the eyelids, von Graefe symptom, swelling of the thyroid, etc., in the dispensary cases, gives the following results: The von Graefe symptom was found marked in twenty-three cases and slight in eleven cases. Retraction of the eyelids was found present in sixteen cases. The vasomotor tone was deranged in eleven cases. This, together with the tremor in seventy-one cases, will show the frequency of this symptom in walking cases. In one case a very marked condition of exophthalmic goiter developed while the patient was under observation and treatment for pulmonary tuberculosis.

Case No. 2175. Female. Age, forty-three. Color, white. Admitted 7-14-'03, under the care of Dr. Walsh. At that time she had incipient tuberculosis of the left apex, which, according to the patient, had existed for three months; and, according to history and examination, at least one year. Apart from the usual symptoms of early tuberculosis, she had a persistent tachycardia, with pulse 120 and somewhat intermittent. She again came under observation 3-10-'04, under Dr. Cummins. This

time there was much more extensive involvement, affecting almost the entire upper lobe of the left side. There was no enlargement of the thyroid gland, no exophthalmos, no von Graefe symptom, and the pupils were equal and responded promptly to light. There was evidence of cardiac hypertrophy, but no murmurs. The left border of the heart extended midway between the midclavicular line and the anterior axillary line. During 12—'04, she became very nervous, easily excited, and complained of "flushings of heat" and palpitations of the heart. During the following two months she began to have swelling of the neck, with some exophthalmos and marked von Graefe symptoms. The note on the history on 2—9—'05 states: "The patient presents every evidence of exophthalmic goiter." This condition improved somewhat under the dietetic regimen, iodine, and static current, but later became much worse. There is now marked dilatation of the heart; the patient is confined to bed. This is due more to the heart condition than to the pulmonary lesion, which is confined to the upper lobe of the left side.

D. J. MCCARTHY.

THE MENTAL ATTITUDE IN TUBERCULOSIS.

The impression one gains after a series of inquiries from the patients themselves as to their mental state is that the greater number are more or less depressed, though they still retain the hope of improvement or cure. It is, however, the nature of mankind under any adverse circumstances to cling, though it be but feebly, to a belief in that which one most desires, even when beset by doubts. The tuberculous people with whom I have talked have not, in the main, given evidence of an excessive trust in their future physical welfare. The expectations that they have shown have not been those of expansive mental states. When they have displayed unreasonable confidence, it has usually been due to ignorance of their true physical condition, and an inability to appreciate the seriousness of their disease because they were not suffering.

On the other hand, that they should be depressed, there is every reason to expect. The lowered vitality, and the knowledge of bodily harm that they are undergoing, together with the altered circumstances, frequently quite horrible, are more than sufficient to cause a greater lowering of spirits than one apparently meets. It is, indeed, astonishing, at first blush, that some people who are quite ill and no longer able to maintain themselves or their families should remain cheerful and even happy, as the word goes. But tuberculosis can hardly be thanked for that. It is necessary to go further back and inquire what was the original temperament of the patient, and it will be found, in a certain number of cases, that the individual was blessed with a buoyancy, or a sense of well-being, or indifference, as the case may be, that was well-nigh impregnable.

The question, then, must be not are tuberculous people particularly optimistic or hopeful or cheerful or anything else, but do they undergo a change of mental state? And this I think may be answered reservedly in the affirmative—so reservedly, indeed, that one must say that generally the change is due to chronic illness rather than to tuberculosis specifically. Having claimed this freedom from specific influence, one must promptly whirl about and assert that in a certain number of cases the disease does affect the brain markedly—that here are found more or less characteristic mental states which are over the normal borderland. But of these I shall speak later on.

Well, then, in the long run, what are the changes, if there are any, in disposition or mental state that the tuberculous individual does undergo? They are what one would expect from the condition of the general nervous system, which is one of irritability—the irritability of weakness. The spinal reflexes are almost universally increased before the very advanced stages have been reached, in a limited number of which, as Dr. McCarthy has shown, they are abolished. And this same irritability is evident in the brain. The vast majority of tuberculous patients will promptly admit that they are more irritable since they have been afflicted with the disease. They frequently describe themselves as “cranky.” With this, in many cases, is a greater tendency to worry, though here, of course, circumstances, which have become so much more unfavorable, play a large part. But the sense of apprehension and the dread of trouble, as well as the susceptibility to annoyance, are increased independently of external conditions. The patient often admits that he is less cheerful or less sociable, and that his outlook tends more toward pessimism. On the other hand, he may simply be more indifferent, or quieter, or have become entirely ambitionless. Any one, two, or all of these changes may be present in the tuberculous individual.

But even those who acknowledge that they are less opti-

mistic or have a tendency to melancholy will say, when asked whether they expect to get well, "I hope so." The very fact that an individual has lost much of his initiative, and to a degree his self-control, and feels strongly the necessity to be directed, makes him particularly susceptible to suggestion. He is quite ready to accept, therefore, the assertion of the doctor that he will get better, and naturally does not always interpret literally this promise, but takes it to mean cure. The modern attitude of the profession is hopeful, and one would expect that patients coming to a hospital like the Phipps Institute should immediately feel this general optimistic atmosphere, even before being brought closely in contact with the doctor. They, of course, know really nothing of the possibilities in their particular cases. But in spite of this they do not show any excessive confidence about recovery. The mental attitude in regard to that is really rather passive, with an understratum of natural hopefulness, tempered frequently by lowered spirits. Some visiting the dispensary have said, "I was not hopeful before coming here, but I am now." In the advanced stages others have said, "I did think I might get well, but I have now seen too much of the disease and do not believe that I can ever be cured." And yet these latter cases may be quite cheerful.

There are many people seriously afflicted with the disease who know, as well as the doctor, that their chances of even partial recovery are of the very slimmest, but who are, nevertheless, perfectly philosophical. In fact, it is not rare for the more advanced cases, especially if they are comfortably provided for, to be happier than they were at an earlier stage of the disease. They have become resigned, and are no longer living under the struggle of keeping up the battle of life or its appearance. They may readjust themselves toward the universe, become more contemplative, and, if not suffering, enjoy the quiet amusements of the present. A limited number either turn or become more religious, and this, needless to say, has a soothing effect.

On the other hand, some patients become more and more despondent, more and more irritable, suspicious, and may be obstinate, as their condition gets worse. There is no rule. The physical comfort or suffering naturally plays a very large part. Nevertheless, in the main, people afflicted with advanced tuberculosis are less happy than they were in health, even though the change is but slight.

The figures given below may not seem to bear this literally out, but a certain allowance must be made for a rather dull class, failing to give account of slight changes in themselves. The cases here analyzed were mainly seen in the dispensary; only a small proportion of them, in fact, were in the hospital. Consequently the examination consisted in an interview with the patient, and not a prolonged and familiar observation, which would, doubtlessly, in at least some instances, have given moderately different results from those obtained. In many cases all the questions could not be answered, in some none, on account either of the inability of the doctor to converse in Yiddish or other strange languages, or the dense stupidity and ignorance of the patient. A few also were children. Of the two hundred and thirty-seven nervous examinations here reported upon, for instance, thirty-one show no record as to whether there was any change of disposition.

EDUCATION.

Education was.....	Good,	5	} 237
	Fair,	75	
	Poor,	92	
	None,	27	
	Children,	11	
	No record,	27	

The family history and extent of the education were first inquired into. Those that left school at thirteen years or before are classified as having a poor education, those who continued to the fifteenth or sixteenth year as having a fair one, and those

who kept at their studies until nineteen or twenty as having a good one. Of course, the impression formed of the patient helped to place him in one of the above classes. Naturally, the whole standard is lowered in estimating people in this walk of life. What is here called a fair education would be considered poor for the well-to-do. And in many of the ninety-two cases whose schooling was meager, it was very meager, indeed. The extent of education is of interest as an index, though by no means a reliable or exact one, of the mental activity of those under consideration. Many were certainly very dull. It is apparent that the uneducated classes have less consciousness than the better-schooled portion of humanity, and formulate to a far less degree their feelings or desires. Nor are they likely to reason about these. Consequently, having lived almost wholly in sensation, they are unable to describe themselves. It was frequently, therefore, very difficult to get any sort of coherent account of their dispositions, or to have any light thrown upon their mental attitude. In fact, there often seemed to be no mental attitude at all.

HISTORY OF NERVOUS DISEASE IN FAMILY.

History,	{	Positive, ... 4 (1 non-tuberculous)	{	Chorea,	}	237
		None, 184 (26 non-tuberculous)		Epilepsy,		
		No record, . 49 (3 non-tuberculous)		Acute anterior poliomyelitis, .		

HISTORY OF INSANITY IN FAMILY.

History,	{	Positive,	11	}	237
		None,	177 (27 non-tuberculous)		
		No record,	49 (3 non-tuberculous)		

It is instructive to note that of these two hundred and thirty-seven nervous examinations thirty cases were diagnosed as not having tuberculosis. The examinations, therefore, were not selected. Only a very few of the patients were confined to bed—

certainly less than a dozen. They have been classified very roughly, according to the stage or extent of the disease, as fifty-five incipient, sixty-six with medium involvement (having a whole lobe or two lobes infiltrated), and seventy-nine advanced. Any case showing cavity has been called advanced. There were twelve whose disease was very old and not progressing.

DISPOSITION.

Patients with	{	Cheerful tem- perament, ... 155	} 237	{	Some change in disposition, ... 148 (18 non-tuberculous)	} 237
		Unhappy tem- perament, ... 22			No change in disposition, ... 58 (5 non-tuberculous)	
		Intermediate temperament, 29			No record of change in dis- position, 31 (7 non-tuberculous)	
		No record of temperament, 31				

As mentioned, out of the two hundred and thirty-seven cases, thirty of which were non-tuberculous, thirty-one records are blank as to the disposition; but of the two hundred and six remaining, only twenty-two gave their disposition in health as belonging to the unhappy or melancholic or pessimistic type, while one hundred and fifty-five placed themselves under the headings of cheerful, happy, lively, optimistic, etc., and twenty-nine described themselves as intermediate—not distinctly one or other. Of these two hundred and six there were one hundred and forty-eight (eighteen non-tuberculous) who showed some change of disposition since illness, and fifty-eight (five non-tuberculous) who showed none. The most constant change was the birth or growth of irritability. Many who were good-natured or easy-going became irritable or excitable, and a few originally slightly impatient became more “cranky.” In all, one hundred and nine (eleven non-tuberculous) confessed to irritability, and a dozen more (one non-tuberculous) said they worried without any increase of excitability. Of the cheerful class, forty-two (three non-tuberculous) became less cheerful, inclined to melancholy, or pessimistic, and often quieter; while the originally

pessimistic usually became more so. There were twenty-two people (one non-tuberculous) who had become indifferent, ambitionless, absent-minded, dull, quieter, less sociable, or all of these. Only two out of the one hundred and forty-eight showed a change the other way. One claimed to have been cranky, stubborn, pessimistic, and quiet, and to have become more lively, less cranky, and more optimistic; the other to have been easy-going and optimistic, but to have become more so. Both of these were cases of tuberculosis.

It should be here remarked that people in whom the disease has been very long existent may give themselves, or be given, credit for a native disposition which was really not conferred upon them at birth. Unquestionably, some people labor under an unhappy or irritable temperament which has been formed by years of physical inadequacy.

PRESENT MENTAL ATTITUDE.

Patients who were.....	{		Hopeful regarding disease,.....	166 (16 non-tuberculous)	} 237	
			Not hopeful regarding disease,.....	32 (4 non-tuberculous)		
			Indifferent regarding disease,.....	1		
			No record,	38 (10 non-tuberculous)		
Patients who were.....	{	Depressed,...	{		} 237	
			Most of the time, .	62 (6 non-tuberculous)		
			At times,	49 (10 non-tuberculous)		
			Seldom,	14 (1 non-tuberculous)		
	{		Not depressed,.....	71 (6 non-tuberculous)		
			No record,	41 (7 non-tuberculous)		
Patients who were.....	{		Suspicious,.....	10 (2 non-tuberculous)	} 237	
			Not suspicious,	184 (20 non-tuberculous)		
			No record,	43 (8 non-tuberculous)		

Five of the one hundred and eighty-four recorded as not suspicious were questionable.

There is reason to believe that this percentage of cases showing suspicion is too low. Doubtless constant association with many of these people would reveal at least a minor grade of suspiciousness that is not detected at a single interview. It is interesting to quote here from The Clinical Lectures on Men-

tal Diseases by T. S. Clouston (Edinburgh): "Origin of Monomania. . . Fourth, most of the remainder, comprising over one-third of the cases, seem to me to arise either out of perverted organic sensations caused by constitutional diseases characterized by lack of trophic power and brain anemia, notably tuberculosis, or out of perverted sensations from local disease misinterpreted by the brain, as in the woman with cancer of the stomach [she believed there was a devil inside her]. *Any man with an anemic, ill-nourished brain is apt to be morbidly suspicious.*

"Many monomaniacs live long, but the cases of morbid suspicion mostly die of phthisis" [p. 276].

"Third. The substitution of fixed delusions or delusional states—monomania—for the exaltation as the latter passes off. It is difficult to find out statistically how often this occurs. The patients may live long when this takes place, except the delusional condition be that of morbid suspicion, in which case there is a risk of dying of phthisis within a few years."

The modern realization of the prevalency of tuberculosis and the knowledge that a vast number of cases have always been habitually overlooked, together with the fact that some incipient or very obscure cases show symptoms of marked neurasthenia, force one to the conclusion that in the above conditions tuberculosis has been present from the beginning.

MEMORY.

Patients who	{	Gave their memory as less good or poor, 59 (7 non-tuberculous)	}	237
		Gave their memory as good or fair, 127 (15 non-tuberculous)		
		Gave their memory as always poor, 2		
		No record, 49 (8 non-tuberculous)		

Naturally, on account of a lack of accurate tests, and also in view of the fact that people are apt to forget more quickly as they grow older, due to indifference, too much dependence must not be placed upon the data in regard to the effect of tuberculosis upon the memory.

SLEEP AND DREAMS.

Patients who	{	Slept well,.....	101 (14 non-tuberculous)	}	237
		Slept fairly,.....	31 (4 non-tuberculous)		
		Slept poorly,.....	81 (8 non-tuberculous)		
		No record,	24 (4 non-tuberculous)		
Patients who	{	Dreamed, ..163 {	Disagreeable dreams, 40 (2 non-tuberculous)	}	237
			Pleasant dreams,.... 42 (6 non-tuberculous)		
			Both or medium,... 81 (12 non-tuberculous)		
			Did not dream,... 42 (2 non-tuberculous)		
		No record, . 32 (8 non-tuberculous)			

There were about twice as many who dreamed occasionally as those who did so frequently.

DELUSIONS.

Patients who	{	Shown an entire absence of delusions,	169 (17 non-tuberculous)	}	237
		Were without record as to this,.....	42 (9 non-tuberculous)		
		Presented the conditions described below,	26 (4 non-tuberculous)		

Some persons have hallucinations which they either do not believe or upon which they place no reliance, as, for instance, a girl who, upon hearing her father call, has gone into the yard to find no one there and admits that the voice may have been imaginary, or a woman who, lying awake at night, has visions of peculiar people standing before her, but knows that they are creatures of fancy. There were six cases which gave a history of such hallucinations—three of hearing and three of vision. On the other hand, there were eleven people who heard voices or saw visions that they took seriously. These experiences were of a spiritual nature. Two heard voices. One, for instance, was told not to worry about her lungs, as they would be taken care of by God, from whom she considered this to be a direct communication. The visions were of dead relatives who came back, and in one instance held a conversation with the patient. Sometimes this occurred in answer to prayer. One ten-year-old

boy had, a year before coming to the dispensary, seen his departed father, but, as his mother stated that she herself had all her life had such experiences, it is fair to suppose that the lad was subjected to powerful suggestion. In two of the individuals who had visions there was a failure to diagnose tuberculosis. One of these was a boy of nine, who had also, when he was a younger child, seen his buried parent. Seven cases presented other varieties of delusions, some of which were transitory. There were two cases of real delusionary insanity, but in neither of these was tuberculosis discovered.

As Dr. McCarthy has discussed the types of insanity found in tuberculosis, they will not be entered into here. That there are distinctly morbid psychological states which cannot be classified as insanity is beyond doubt true, especially in the later stages. And the commonest picture of such abnormal cerebration that the writer has seen is presented by a state in which the patient is morose, very irritable, quick to suspect, ready to find fault, perverse, antagonistic, sometimes almost abusive, perhaps highly emotional, skeptical or pessimistic, and though open to suggestion temporarily, if tactfully managed, very difficult to control in the long run. Experience has prompted me to believe that the state of *spes phthisica* is rare. As mentioned before, the original characteristics are likely to be intensified, and the above picture is far more likely to occur in a self-willed individual than in a cheerful, good-natured person of a yielding temper.

The writer's experience also contradicts the assertion that the *vis sexualis* is increased. No record has been kept of this, although many men were questioned as to their sexual history. The majority declared a falling-off of desire, very marked as the disease advanced, and in some the instinct was altogether abolished. So far no one has confessed to an increase. The women were not questioned upon this subject.

HORACE CARNCROSS.

DERMATOLOGICAL REPORT.

The scarcity of tuberculosis of the skin associated with consumption in our American institutions is conspicuous when compared with the statistics of similar institutions on the continent of Europe. From 1903 to 1905 there have been admitted to the Henry Phipps Institute one case of lupus vulgaris in a tuberculous patient and two cases of tuberculous ulcerations of the skin adjacent to mucous surfaces. This small percentage seems remarkable considering the frequency with which lupus in association with tuberculosis of other organs has been recorded in other countries.

I have consulted the most important institutions of a similar character in this country for comparison, and have received the following reports: Dr. Herbert M. King, of the Loomis Sanatorium, gives one case of lupus in twelve hundred and eleven patients, and no record of any other form of tuberculosis of the skin. Dr. James Lawrason Brown, of Adirondack Cottage Sanitarium, has not one case recorded in two thousand patients. Dr. James H. Heller, of White Haven, makes a negative report on ten hundred and twenty-one cases. Dr. Podstata, superintendent of the Cook County Sanatorium, Chicago, reports nineteen hundred and eighty-five admissions from May 6, 1902, of which six had tuberculosis of the skin, five of them being lupus. Dr. Podstata states that few of the patients were young. Dr. Bushnell, Major Surgeon of the United States Army at Fort Bayard, gives twelve hundred and sixty-eight admissions, with no record of any cases of involvement of the skin. The frequency of lupus in association with tuberculosis of other organs

in other countries is illustrated by the following figures of reliable observers: Felix Block, who studied one hundred and forty-four cases of lupus, found 79 % of them affected with some other form of tuberculosis. Sacks observed 62.3 % of tuberculosis in one hundred and five patients suffering from lupus. Besnier found only eight cases of tuberculosis in thirty-eight cases of lupus. Leloir found 38 % in a study of three hundred and twelve cases. Renouard, in eighty-seven cases of lupus, found 33 % suffering from other forms of tuberculosis. Haslund found 60 % of lupus having other forms of tuberculosis. Bender, in Bonn, found in one hundred and fifty-nine cases of lupus evidence of tuberculosis in 62 %. Of the above cases, 33 % had a hereditary history.

The invasion of the tubercle bacillus into the skin in patients already suffering from tuberculosis of other organs often takes place in the proximity of mucous surfaces. Infection of pre-existing skin diseases or acute lesions may follow scratching. A tuberculous patient not infrequently infects an eczema. Lipp reports a case of a woman infested with lice who developed lupus in the site of scratch-marks. Jadassohn reports a case of tuberculosis verrucosa cutis from the same cause. Leloir reports a tuberculous mother who infected her child with lupus by dressing an eczema with a bread poultice which she had chewed before applying. The same writer mentions a nurse who moistened court-plaster with her saliva and implanted lupus in the site of the abrasion. Many similar cases are recorded by Middledorf, Kraske, Verneuil, Corlett, Winfield, Lesser, and others. Animals may be the source of infection of the skin. According to Wahl, excoriations are frequently washed in cream in many parts of France, where the cattle have tuberculosis, and lupus develops. Leloir publishes a case of a healthy farmer's wife who developed a lupus at the site of a wound.

Lupus itself has given rise to lupus in others. Plotnikow's case of a hospital orderly who was inoculated with lupus from

a scratch of an insane patient who had lupus is a case in point. Tuberculous lesions of the skin would be much more numerous than they are if it were not that the temperature of the skin is not favorable to the invasion of the tubercle bacillus, and the uninjured epidermis affords an excellent protection.

Location is a determining factor in lupus. According to Raudnitz, of two hundred and nine cases of lupus, sixty-five, or 6 %, involved the nose, lips, and the angle of the eye, and 24 % the trunk and extremities. According to Gramm, for five hundred and seventy-three cases of lupus involving unprotected parts of the skin only sixty-two cases involved covered parts.

The fact that lupus is not often contracted in adult life is a possible factor in its rarity as compared with tuberculosis of other organs. The statistics of the American Dermatological Association from 1878 to 1887 give five hundred and thirty-six cases of lupus in one hundred and twenty-three thousand seven hundred and forty-six cases of diseases of the skin.

In patients suffering with tuberculosis there are lesions of the skin other than those which are strictly tuberculous. From malnutrition and anemia the skin becomes pale and dry and sometimes grayish; it may become glossy, and frequently it is covered with branny scales. From interference with the circulation it assumes a cyanotic hue. The sebaceous glands sometimes secrete excess of sebaceous matter, rendering the skin greasy. This condition was first observed by Frerichs.

Pityriasis versicolor is a common eruption in patients suffering from tuberculosis. The lesions are at first small, but they eventually develop into patches of considerable size, sometimes covering the whole chest. The color of the patches is yellowish brown, and the skin shows branny desquamation. The patient is rarely itchy, except when he sweats profusely. Although the parasite finds favorable soil on patients with tuberculosis, it cannot be said that this form of skin disease is diagnostic of

tuberculosis, as claimed by Barduzzi and Hericourt, who tried to substantiate their claim by inoculation experiments.

Intestinal complications in tuberculosis are responsible for a variety of erythematous eruptions. The forehead and cheeks, especially below the eyes, frequently are sites of brown pigment spots which have received the title of *chloasma phthisicorum*. *Pityriasis tabescentium* is a desquamative process caused by atrophy of the skin, seen in advanced cases of tuberculosis; the patches are larger than in *pityriasis versicolor*, and are not so sharply defined. Clubbed fingers and nodular swellings of the toes and other joints are frequently observed. The x -ray observations made in our laboratory have shown that in these cases the soft parts only are involved. I have found the nails of patients brittle and frequently cyanosed. The hair exhibits degenerative changes: it becomes atrophic and loses its gloss, becoming dry and splitting easily. Falling out of the hair I have found in some cases to be due to atrophy of the follicle. *Herpes zoster* has been frequently observed. Cutaneous *emphysema* is a rare skin condition observed by Corlett, Frantzel, and others.

J. FRANK WALLIS.



FIG. 7.—Caseating tubercles of the choroid plexus of the lateral cerebral ventricles.

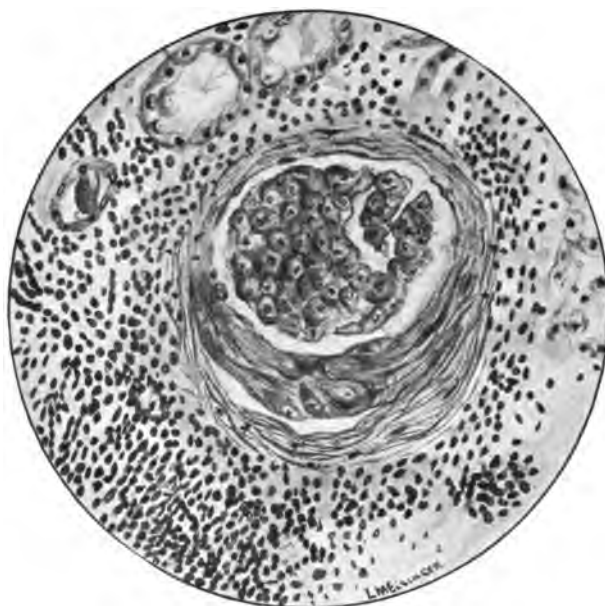


FIG. 8.—Drawing of a possible tubercle beginning around a Malpighian body. Bowman's capsule shows the connective tissue thickened, which is common, and the epithelium proliferated, which is uncommon.

THE KIDNEYS IN TUBERCULOSIS.

A PATHOLOGICAL AND CLINICAL STUDY.

This study was made on fifty-nine cases of advanced tuberculosis of the lungs which came to autopsy at the Henry Phipps Institute, and one private case in which the lung condition was practically cured. They represent a series of sixty consecutive autopsies on cases of tuberculosis. In a clinical study of the urine made three years ago (Flick and Walsh¹) tubercle bacilli were found in the urine forty-four times out of sixty cases. Bacilli in this preliminary study were differentiated from other acid-fast bacilli by the use of alcohol in addition to Gabbet's solution. The present study was made to determine the frequency of absolutely positive tubercles and other abnormalities in the kidneys themselves.

With this purpose in view, the kidneys were cut into very small sections and every abnormality studied first macroscopically, then stained and studied microscopically. The kidneys were usually cut into one hundred and fifty small pieces. A varying number (from twelve to one hundred and twenty) of microscopic sections were studied. Out of the total number of sixty cases, tubercles were found thirty-five times (58 %). These tubercles were all perfectly typical, showing caseation and giant-cells. In addition to these thirty-five cases showing absolutely positive tubercles, three specimens showed a sufficient number of accumulations of round-cells resembling young tubercles, with miliary tubercles elsewhere in the body, to be classified under the head of probable tubercles. Including these three specimens with the tubercles, we have thirty-eight out of the sixty (63 %) in which tubercles were found in the kidneys.

Heyn³ found tubercles twenty-one times in thirty-seven cases (57 %).

Apart from tubercles, the most common and most interesting abnormalities were localized areas showing marked thickening of the interstitial tissue (found thirty-eight times out of sixty cases). These localized fibrous areas were usually situated under the kidney investment, and extended in wedge shape toward the pyramids, varying in length (1-3 or 4 mm.) and breadth (1-2 mm.), and comprehending a smaller or larger number of tubules. In these the interstitial tissue was markedly thickened, the tubules were usually dilated, and the epithelium atrophic. The tubules frequently contained hyaline casts even when no hyaline casts were present elsewhere. The glomeruli were often shrunken and fibroid; Bowman's capsule was almost always thickened. A round-cell infiltration sometimes took the place of connective tissue. In other words, these localized fibrous areas resemble and probably are localized areas of interstitial nephritis.

Macroscopically, these fibrous areas are seen as whitish or yellowish specks on the surface of the kidneys or immediately under or near the capsule on section. They quite resemble tubercles in their appearance, and were more than once mounted and stained under this impression. Microscopically they look like healed or healing tubercles, though they never show giant-cells and only occasionally what appears like a small amount of caseation. Heyn³ describes similar fibrous areas, but does not state their frequency.

Another common (twenty-two out of sixty cases) abnormality was an accumulation of round-cells immediately under the investment. These accumulations varied in size from 0.5 to 1 or even 2 mm. in diameter. They probably represent either young tubercles or beginning localized fibrous areas.

The most common (fifty out of sixty cases) pathological change, not usually mentioned, probably on account of its com-

paratively slight nature, was thickening of the connective tissue of Bowman's capsule. This thickening was usually slight, yet evident to van Giesen's stain.

The actual most common pathological changes were degeneration and necrosis of the epithelium of the convoluted tubules and of the ascending limb of Henle's loop, and hyaline casts.

The typical findings in the nephritis accompanying tuberculosis, therefore, are tubercles, localized areas of fibrous thickening found especially under the investment, localized accumulations of round-cells under the investment, thickening of the connective tissue of Bowman's capsule, degeneration and necrosis of the epithelium of the secreting tubules, and hyaline casts.

Various forms of nephritis were found, namely: passive congestion, one (0.6 %); cloudy swelling, five (8.3 %); acute parenchymatous nephritis, twenty-three (38.3 %); chronic parenchymatous nephritis, eighteen (30 %); diffuse nephritis, four (6.6 %); interstitial nephritis, five (8.3 %); amyloid degeneration, four (6.6 %). A specimen was described as acute parenchymatous nephritis when it showed distinct cloudy swelling and more or less degeneration and necrosis of the epithelium without further change; as diffuse nephritis when there were degeneration and necrosis of the epithelium and considerable interstitial infiltration with round-cells; chronic parenchymatous nephritis when there were disintegration, degeneration, and necrosis of the epithelium, with some thickening of the interstitial tissue; as interstitial nephritis when the thickening of the interstitial tissue predominated the degenerative changes in the epithelium. All these different forms were found with and without tubercles and in such numbers that the tubercles could be considered to have little or no influence on the nephritis, and, reversely, the nephritis little or no influence on the development of the tubercles. Later tables will show the different forms of nephritis with and without tubercles.

The most common forms of nephritis, therefore, in my cat-

egory were acute and chronic parenchymatous nephritis. Coffin,³ Landouzy and Bernard,⁴ Le Noir (quoted by Guihal),⁵ and Lerrede⁶ all describe chronic parenchymatous nephritis as the common form. Coffin³ calls his common form diffuse, but he describes it as a degeneration of the epithelium accompanied by an increase in the interstitial tissue, which description corresponds to the usual chronic parenchymatous nephritis. Le Noir says, in autopsies on the tuberculous, amyloid degeneration is found in 12 % of cases and large white kidneys in 40 %.

In each kidney the organ in general and every part of the structure, whether normal or abnormal, was commented on, namely: the kidney investment; the distance of the Malpighian bodies from the kidney investment; the condition of the convoluted tubules between the kidney investment and the first row of Malpighian bodies; the condition of the glomerulus, of Bowman's capsule; the amount of space between the glomerulus and Bowman's capsule; the condition of the convoluted tubules throughout the cortex, of the interstitial tissue between them, of the secretory tubules of the medullary rays, and, in a general way, of the pyramids.

The macroscopic appearance of the kidney is usually somewhat larger than normal, frequently normal, and rarely smaller. Out of the fifty-four cases recorded it was larger than normal twenty-four times, normal eighteen times, and smaller than normal twelve times. Out of the fifteen recorded cases of chronic parenchymatous nephritis six were larger, three smaller, than normal and six normal; out of the four cases of diffuse nephritis two were normal and two were larger than normal; out of the four cases of amyloid degeneration two were larger than normal, one smaller than normal, and one normal.

The capsule strips easily, though at certain points it may be slightly adherent. On section the kidney structure is usually pale (forty times out of forty-four recorded cases) and frequently somewhat yellowish. The *venæ stellatæ* are usually prominent.

The cortex is usually broader than normal. A careful study frequently shows millet-seed-sized pale or yellowish areas, especially under the investment, which are either tubercles or localized fibrous areas.

The macroscopic diagnosis of the kidney condition made at autopsy from the general appearance frequently differed from the microscopic diagnosis. In the five cases of cloudy swelling the macroscopic diagnosis was twice parenchymatous nephritis, twice fatty kidneys, and once cloudy swelling. In the twenty-three cases of acute parenchymatous nephritis the macroscopic diagnosis was twice toxic nephritis, nine times parenchymatous nephritis, five times congestion, twice diffuse nephritis, once fatty kidney, once nephritis, and three times negative. In the eighteen cases of chronic parenchymatous nephritis the macroscopic diagnosis was once toxic nephritis, six times parenchymatous nephritis, four times fatty kidney, twice cloudy swelling, twice interstitial nephritis, twice congestion, and once negative. In the five cases of interstitial nephritis the macroscopic diagnosis was once fatty kidney, once toxic nephritis, once miliary tuberculosis, and twice negative. In the four cases of diffuse nephritis the macroscopic diagnosis was twice parenchymatous nephritis, once miliary tuberculosis, and once negative. In the four cases of amyloid degeneration the macroscopic diagnosis was once fatty kidney, once miliary tuberculosis, and twice amyloid.

Thirty kidneys out of sixty were diagnosed as showing tubercles at the autopsy. In these thirty cases positive tubercles with caseation and giant-cells were found microscopically twenty-three times. In addition tubercles were found microscopically in twelve cases. Tubercles were found in all stages, from the microscopic accumulation of round-cells to the large cavity of a surgical kidney (two cases). The typical ones on which the diagnosis of tubercles was based always contained caseation and giant-cells. In the thirty-five cases they were found in the cor-

tex twenty-six times, in both cortex and pyramids five times, and in the pyramids alone four times. Their place of predilection in the cortex was near the investment. From a study of the tubercle in every stage of development it appears that the most common starting-point of the tubercle is the connective tissue around a Malpighian body, or, if the localized fibrous areas already spoken of represent healing tubercles,—and I think they do,—the connective tissue immediately under the investment. This latter idea appeals to one on account of the analogy with the lungs, brain, liver, and spleen.

A drawing of a tubercle beginning about a Malpighian body is shown. In this we have a typical accumulation of round-cells about a Malpighian body; the connective tissue of Bowman's capsule is markedly thickened and the epithelium proliferated though the glomerulus itself appears healthy. This appearance of the Malpighian body is common in tubercles. Taking a typical tubercle, we usually find in the center a certain amount of caseation with no evidence of Malpighian bodies or tubules. Proceeding from the center the first Malpighian body usually shows the glomerular loops fibroid, and the connective tissue of Bowman's capsule markedly thickened and frequently fibroid. Sometimes the glomerulus and Bowman's capsule are represented only by a shriveled, scarcely recognizable, fibroid mass. Toward the periphery Malpighian bodies show similar to this one in the microphotograph. In other words, the tuberculous infiltration usually advanced between the tubules and Malpighian bodies and completely surrounds them before destroying them. Rarely, however, we find the Malpighian bodies or tubules at the edge of a tubercle with one half destroyed, the other half remaining apparently healthy. Tubules at the edge of the tubercle practically always contain hyaline casts. In only two cases out of the sixty were casts not found.

The tendency toward healing seems at least as great in the kidneys as in other organs. I have records of five definitely

healed tubercles. The small number is readily accounted for by the fact that the cases had died of advanced tuberculosis, and all tubercles not actually healed would probably have broken down. In these healed and other apparently healing tubercles tubules were found crossing practically through the center. A drawing shows such a specimen. These tubules resemble in their young, healthy appearance the so-called new bile-ducts evident in hypertrophic cirrhosis of the liver. There is no criterion by which these healed tubercles can be positively assured to be tubercles, therefore they were never reckoned among the positive tubercles.

Localized fibrous areas were present in seven cases of acute parenchymatous nephritis with tubercles and six cases of acute parenchymatous nephritis without tubercles; in ten cases of chronic parenchymatous nephritis with tubercles and four cases of chronic parenchymatous nephritis without tubercles; two cases of cloudy swelling without tubercles; in three cases of diffuse nephritis without tubercles and one case of diffuse nephritis without tubercles; in two cases of interstitial nephritis with tubercles and two cases of interstitial nephritis without tubercles; and in one case of amyloid degeneration with tubercles.

Accumulations of round-cells under the investment were found in three cases of acute parenchymatous nephritis with tubercles and three cases of acute parenchymatous nephritis without tubercles; in seven cases of chronic parenchymatous nephritis with tubercles and two cases of chronic parenchymatous nephritis without tubercles; in two cases of diffuse nephritis with tubercles; two cases of interstitial nephritis with tubercles and in two cases of interstitial nephritis without tubercles; in one case of cloudy swelling without tubercles.

The principal things mentioned about the glomeruli in each case are whether or not the glomeruli were swollen, congested, vacuolated, or fibroid. The glomeruli were usually swollen (forty-eight times out of fifty-two recorded cases), and there was

scarcely any kidney that did not show a few glomeruli fibroid. By fibroid here is meant a shriveled condition with a lessened number of nuclei. About these fibroid glomeruli Bowman's capsule was always thickened, and its connective tissue frequently showed fibroid change. The glomeruli were frequently congested without congestion appearing in other parts of the kidneys. The reverse was also sometimes true. The glomeruli were found congested (either with or without congestion of other parts) forty-one times in sixty cases, the cortex (apart from the glomeruli) thirty times, and the pyramids thirty-nine times.

By vacuolated is meant small vacuoles looking like fat-droplets in the midst of the loops probably in the endothelium—at least Le Noir (quoted by Guihal)⁸ describes them as fat-droplets in the endothelium. Such vacuolization was very frequent (thirty-six times out of fifty-six recorded cases). None of the abnormalities in the glomerulus were more common to one kind of nephritis than to another, and none were influenced by the presence or absence of tubercles.

Bowman's capsule showed the connective tissue more frequently thickened than normal. Out of the sixty cases the connective tissue was thickened fifty times. There was proliferation of the epithelium of Bowman's capsule only two or three times. It is stated thus indefinitely because once it was difficult to say whether it was the connective tissue that was thickened or the epithelium proliferated. D'Arrigo⁷ has described a true glomerulitis which I have failed to find.

Durand-Fardel and Coffin⁸ found the glomerular cavity usually dilated. Lerrede⁸ found no free space. In this series, out of the forty-five recorded cases there was no space between the glomerulus and Bowman's in eleven cases; one line space (or practically normal) in thirty cases; two lines space, or what might be called dilatation, in four cases. In other words, the space was usually normal. It appears to me that this difference might be due to fixation.

Some observers have found infiltration about Bowman's capsule rather frequently. Individual kidneys showing tubercles not infrequently show infiltration, looking like a beginning tubercle, around one or several Malpighian bodies, but infiltration about Bowman's capsule generally distributed throughout a specimen is rare. This series showed it four times.

The convoluted tubules commonly showed degeneration and necrosis of the epithelium, more or less extensive and widespread. Under the investment the convoluted tubules were usually dilated and the epithelium atrophic. In advanced cases of parenchymatous nephritis the epithelium, even when atrophic, was disintegrated, frequently filling the lumen with débris. Elsewhere, that is, from the outer row of the Malpighian bodies to the pyramids, the convoluted tubules frequently showed themselves as a swollen, degenerated, disintegrated, necrotic, hyaline mass in which the tubules could scarcely be distinguished. Sometimes (four times out of sixty cases) the convoluted tubules were dilated and the epithelium atrophic throughout the whole cortex. The statistics of the condition of the convoluted tubules is evident from the microscopic diagnosis.

The interstitial tissue was thickened in twenty-seven cases (namely, in the cases of chronic parenchymatous, diffuse, and interstitial nephritis). This thickening was, in the majority of cases, not marked, and sometimes required confirmation by van Giesen's stain in order to prove it. The only five cases in which it was distinctly marked were those of interstitial nephritis. D'Arrigo⁷ found in nine consecutive cases of advanced tuberculosis of the lungs chronic interstitial nephritis. It seems to me that this is rather a peculiar coincidence, or he judged from localized fibrous areas. His findings are opposed by all the other authorities that I have seen.

A special study of the blood-vessels was, unfortunately, not made, but will be made for the next year's report. I can say, however, that endarteritis is very uncommon.

Only a superficial study of the pyramids was made. This was principally for congestion and casts. The pyramids were congested thirty-nine times. Casts were found in the pyramids only a few times—five or six at the most.

Other abnormalities: Two infarcts were found, in one case of acute parenchymatous nephritis and in the one case of passive congestion. Cysts were found in three cases of acute parenchymatous nephritis, five of chronic parenchymatous nephritis, two of diffuse nephritis, one of interstitial nephritis, and two of amyloid degeneration. They were usually small, varying in size from a pin-head to a split-pea. In two cases one was found as large as a walnut. These cysts were usually found in the cortex, and in several cases could be definitely determined to be dilatations of Bowman's capsule.

The specimens were usually hardened in Müller formol, mounted in celloidin, and stained by hematoxylin and eosin. Sixteen were also mounted in paraffin and stained by hematoxylin and eosin and van Giesen's. All except two (Nos. 2356 and 2490) were stained by gentian-violet; only four showed amyloid. The two not stained by gentian-violet showed no appearance of amyloid macroscopically or microscopically. Late in the study six specimens were stained by osmic acid. Of these six specimens only one (No. 2855) is fully reported. The other five belong to autopsies which will be reported next year. No very distinct evidences of fatty degeneration were found in these cases. One or at the most two lines of fine granules were found along the edge (in the epithelium) of many tubules, both in the cortex and in the pyramids.

Clinical symptoms of nephritis in tuberculosis: The literature on the clinical symptoms of nephritis in tuberculosis is very imperfect. Landouzy and Bernard⁴ found wasting, edema, diminution in the amount of urine with a noticeable quantity of albumin, lumbar pains, and digestive disturbances (vomiting and diarrhea). They insist that the finding of these symptoms

calls for a careful examination of the lungs, and that this will usually reveal involvement of one or the other apex. The urine, though usually diminished in quantity, may be increased on a milk diet.

Coffin⁸ found lumbar pains frequently, albumin rarely, hematuria sometimes, especially in association with lumbar pains.

Le Noir (quoted by Guihal)⁶ notes edema as one of the most frequent symptoms, but he met a number of cases of amyloid degeneration. He also notes lumbar pains, dryness of skin, and dyspnea.

Three years ago Flick and Walsh¹ made a preliminary report of a study of the urine in sixty cases of tuberculosis, and reported the clinical symptoms of nephritis in tuberculosis to be pain or severe ache in the lumbar region, the presence in the urine of hyaline and granular casts, pus, or white blood-corpuscles, rarely albumin, and frequently tubercle bacilli, provided tubercle bacilli were carefully searched for.

Of sixty cases of clinical tuberculosis taken more or less at random (many being early cases), they found tubercle bacilli forty-four times. Out of the forty-four cases that showed tubercle bacilli in the urine twenty-nine complained of more or less severe pain in the lumbar region over varying periods of time. They were suffering from this pain when the urine was collected. Out of the thirty-six cases in which the urinary sediment was examined thirty showed casts or white blood-corpuscles. Of these thirty only two showed albumin. Another prominent accompanying symptom which they reported was marked accentuation of the aortic second sound, though the number of cases in which it appeared was not stated.

In a paper on "The Vicarious Action of the Bowels for the Kidneys in Tuberculosis," read at the meeting of the National Association for the Study and Prevention of Tuberculosis, Washington, D. C., May 19, 1905, Flick and Walsh presented another not uncommon, though by no means constant, symptom accom-

panying nephritis, namely, diarrhea. This report gave eleven cases of diarrhea without ulceration of the bowels or other apparent cause except the nephritis.

Out of the fifty-nine recorded cases in this series the bowels were loose twenty-seven times; out of these twenty-seven cases thirteen showed intestinal ulceration. The bowels were constipated twelve times, and of these three showed ulceration. The bowels were regular twenty-one times, and of these, five showed ulceration.

Ulceration of the bowels and diarrhea occurred in connection with the different forms of nephritis as follows:

	TUBERCLES.	ULCERS WITH DIARRHEA.	ULCERS WITHOUT DIARRHEA.	DIARRHEA WITHOUT ULCERS.
Cloudy swelling,	{ With, Without,....	1 2	.. ..	.. 2
Acute parenchymatous nephritis, .	{ With, Without,....	5 2	3 1	3 2
Chronic parenchymatous nephritis, {	{ With, Without,....	1 ..	4 2	1 2
Diffuse nephritis,	{ With, Without,....	.. ..	.. ..	1 1
Interstitial nephritis,.....	{ With, Without,....	1 ..	.. ..	2 ..
Amyloid degeneration,	{ With, Without, ...	.. ..	2 ..	.. 1

Diarrhea is supposed to be common with amyloid degeneration; this series showed it but once.

Edema is commonly considered a symptom of either heart or kidney disease, therefore, in the following table, cardiac disease is shown when present. This cardiac disease is reckoned from the pathological findings.

	TUBERCLES.	EDEMA. WITH WITHOUT HEART DISEASE.		NO EDEMA. WITH WITHOUT HEART DISEASE.	
Cloudy swelling,	{ With, Without, ..	..	1	..	..
Acute parenchymatous nephritis, ..	{ With, Without, ..	2	5	4	3
Chronic parenchymatous nephritis, {	Without, ..	3	1	3	2
Diffuse nephritis,	With,	3	3	3	3
	Without, ..	..	..	3	3
Interstitial nephritis,	With, .....	..	1	2	..
	Without, ..	..	..	..	1
Amyloid degeneration,	With,	1	..	1	..
	Without, ..	1	..	..	2
Passive congestion,	With, .....	..	1	..	1
	Without, ..	..	..	2	..
	With, .....	..	..	..	..
	Without, ..	..	..	..	1

Edema is ordinarily reckoned a common symptom of nephritis, but it does not appear so in connection with my own studies. In this series it was present and absent under all conditions, consequently it gives no clue to the condition.

The chemical and microscopic examination of the urine in these cases was usually made only once, and that on the patient's admission to the hospital. The specific gravity was over and under 1020, in forty-three cases recorded as follows:

	TUBERCLES.	UNDER 1020	OVER 1020
Cloudy swelling,	{ With, .....	..	1
	{ Without, ..	..	2
Acute parenchymatous nephritis, ..	{ With,	2	10
	{ Without, ..	1	7
Chronic parenchymatous nephritis, {	With,	2	8
	Without, ..	..	2
Diffuse nephritis,	{ With, .....	..	2
	{ Without, ..	..	..
Interstitial nephritis,	{ With, .....	..	2
	{ Without, ..	1	1
Amyloid degeneration,	{ With,	1	1
	{ Without, ..	..	..

Out of the sixty cases, twenty-five showed albumin—the majority, however, only a slight trace. It was found in two cases of cloudy swelling, ten of acute parenchymatous nephritis, six of chronic parenchymatous nephritis, two of diffuse nephritis, two of interstitial nephritis, and three of amyloid degeneration. It was found in fourteen cases with tubercles and eleven cases without tubercles. Its occurrence, therefore, does not aid in determining the severity of the nephritis or the presence of tubercles. In these cases the urine was examined for albumin by Mr. Karl W. Smith, who considers the slightest response to heat and acetic acid as positive. In my personal study of the urine in tuberculous cases three years ago I found albumin only twice in forty-four cases which showed tubercle bacilli in the urine. My tests were heat and nitric acid and potassium ferrocyanid and acetic acid.

Guihal⁵ quotes Gauche as finding albumin in the urine of nine out of forty-six tuberculous cases; Lacombe, six out of one hundred; Le Noir, two hundred and eighteen out of seven hundred and fifteen; Andiganne, fifty out of one hundred. Guihal himself says that the albumin may be temporary or intermittent, that it is more common in the evening than in the morning urine, and that it is more frequent in young adults and less frequent between the ages of thirty and forty. In this series the ages of the patients showing albumin in the urine were: cloudy swelling, 16, 22; acute parenchymatous nephritis, 6, 17, 19, 28, 28, 32, 37, 38, 42, 46; chronic parenchymatous nephritis, 28, 31, 33, 33, 40, 45, 53; diffuse nephritis, 32, 47; interstitial nephritis, 33, 57; amyloid degeneration, 32, 35. No connection of albumin could be made out between the ages and tubercles in the kidneys.

Out of the sixty cases eight showed casts. This small number of casts may be accounted for by carelessness in the examination of the urine. The urine was examined by many different individuals and with varying degrees of care. The examination for casts in the preliminary study by Flick and Walsh

was never made on less than six ounces of urine centrifugated in a water-motor centrifuge, and out of the thirty-six cases examined, casts were found twenty-four times.

The urine of only a few of these sixty cases was examined for tubercle bacilli. Under the direction, however, of Dr. Ravenel and myself, Mr. Smith has recently made an inoculation study of twenty-one urines. He inoculated each time the carefully washed sediment of about two thousand centimeters of urine. Altogether, fifty-four guinea-pigs were used. Out of the twenty-one cases four sets of guinea-pigs died of septicemia in three or four days. Out of the remaining seventeen tubercles were found in the guinea-pigs after six weeks fourteen times ($82\frac{1}{2}\%$). The complete details of this inoculation study will be made in next year's report.

The different forms of nephritis were found in males and females according to age as follows:

		TUBERCLES.	AGE.
Males, .	{ Cloudy swelling,	With,	23.
		Without,....	16, 18, 22.
	{ Acute parenchymatous nephritis, .	With,	6, 20, 28, 34, 34, 36, 37, 42, 46, 46, 48.
		Without,....	14.
	{ Chronic parenchymatous nephritis,	With,	18, 26, 27, 29, 39, 52.
		Without,....	28, 31, 33, 33, 36, 45, 64.
	{ Diffuse nephritis,	With,	27, 47.
		Without,....	32.
	{ Interstitial nephritis,	With,	44, 53, 57.
		Without,....	22, 33.
Females,	{ Amyloid degeneration,	With,	17.
		Without,....	..
	{ Passive congestion,	With, .....	..
		Without,....	21.
	{ Cloudy swelling,	With, .....	..
		Without,....	33.
	{ Acute parenchymatous nephritis, .	With,	28, 28, 32, 42.
		Without,....	17, 19, 19, 28, 28, 35, 38.
	{ Chronic parenchymatous nephritis,	With,	22, 33, 35, 40.
		Without,....	37.
	{ Diffuse nephritis,	With,	31.
		Without,....	..
	{ Interstitial nephritis,	With, .....	..
		Without,....	..
	{ Amyloid degeneration,	With,	27, 32.
		Without,....	35.

In other words, age and sex showed no influence on the form of nephritis or on the development of tubercles.

The heart condition, both clinically and pathologically, is said to correspond with certain forms of nephritis. Guihal⁸ reports that Torkiomian, a pupil of Potain's, found in renal tuberculosis the arterial tension diminished, the pulse rapid and weak, and a mesosystolic murmur at apex. The only symptoms that I find recorded clinically in these sixty cases are murmurs, the accentuation of the second sounds at the aortic and pulmonary valves, and the pulse-rate. Murmurs were found but nine times as follows: Systolic murmur at apex in one case of acute parenchymatous nephritis with tubercles and one case of acute parenchymatous nephritis without tubercles; at pulmonic area in one case of acute parenchymatous nephritis with tubercles and one case of acute parenchymatous nephritis without tubercles; two cases of chronic parenchymatous nephritis with tubercles. Presystolic mitral murmur in one case of acute parenchymatous nephritis with tubercles, one case of interstitial nephritis without tubercles. Slight systolic murmur at aortic cartilage in one case of interstitial nephritis with tubercles.

The second sounds were accentuated as follows:

	TUBERCLES.	No. CASES.	SECOND PULMONIC ACCENTUATED.	SECOND AORTIC ACCENTUATED.	BOTH ACCENTUATED.	NOT ACCENTUATED.	UNRECORDED.
Cloudy swelling,	With,	1	..	..	..	1	..
	Without,	4	..	..	2	2	..
Acute parenchymatous nephritis, ...	With,	15	2	2	1	10	..
	Without,	8	5	1	1	1	..
Chronic parenchymatous nephritis, ..	With,	10	3	1	1	4	1
	Without,	8	2	..	..	6	..
Diffuse nephritis,	With,	3	1	..	1	..	1
	Without,	1	..	..	..	1	..
Interstitial nephritis,	With,	3	1	..	2	..	..
	Without,	2	..	..	..	2	..
Amyloid degeneration,	With,	3	..	..	..	3	..
	Without,	1	..	..	..	1	..

From these statistics nothing can be gathered relative to the significance of murmurs or of the accentuation of the second sounds in connection with nephritis.

The pulse-rate was over 120 (patients at rest or even in bed) in three cases out of five of cloudy swelling; ten cases out of twenty-three of acute parenchymatous nephritis; six cases out of eighteen of chronic parenchymatous nephritis; one case out of four of diffuse nephritis; two cases out of five of interstitial nephritis; two cases out of four of amyloid degeneration; and in the one case of passive congestion.

In regard to the heart pathologically we found the following: In the one case of passive congestion the heart was normal; in the one case of cloudy swelling without tubercles the heart was normal; in the four cases with tubercles it was normal once, showed dilated right ventricle once, mitral sclerosis once, vegetative endocarditis once; in the fourteen cases of acute parenchymatous nephritis with tubercles it was normal eight times, showed mitral sclerosis once, mitral sclerosis and dilated right ventricle four times, and hypertrophy once; in the nine cases without tubercles it was normal once, showed dilated right ventricle twice, mitral sclerosis once, mitral and aortic sclerosis once, and the arteries showed sclerosis four times; in the twelve cases of chronic parenchymatous nephritis with tubercles it was normal six times, enlarged twice, showed dilated right ventricle twice, dilated right ventricle with arteriosclerosis once, and the arteries showed slight arteriosclerosis once; in the seven cases without tubercles it was normal four times, and showed hypertrophy twice. In the three cases of diffuse nephritis with tubercles it was normal once and showed dilated right and left ventricle twice; in the one case without tubercles it was normal. In the four cases of interstitial nephritis with tubercles it was normal twice, showed mitral sclerosis with arteriosclerosis once, and the arteries showed sclerosis once; in the one case without tubercles it showed dilated right and left ventricle. In the three

cases of amyloid degeneration with tubercles it was normal twice and showed slight mitral sclerosis and arteriosclerosis once; in the one case without tubercles it was enlarged. From these statistics it is evident, at least, that tubercles in the kidneys have no influence on the heart condition, and it would appear that the pathological condition generally had but little influence. All in all, the heart was more frequently normal than abnormal.

Guihal⁶ mentions as further symptoms of renal tuberculosis albuminuric bronchitis and bronchopneumonia. These were not especially looked for in these statistics, but will be next year. Dyspnea is considered an important symptom in connection with nephritis, but after a careful study of the respiration no statistics of any value whatsoever could be made. This might have been theoretically assumed on account of all the patients dying with advanced tuberculosis of the lungs. Out of the fifty-nine recorded cases thirty-six showed respirations over forty.

	TUBERCLES.	NUMBER OF CASES.	AVERAGE DURATION, YEARS.	AVERAGE LOSS OF WEIGHT, POUNDS.
Cloudy swelling,	With,	1	3	22
	Without,	4	1	31
Acute parenchymatous nephritis, .	With,	14	3½	43
	Without,	9	2½	34
Chronic parenchymatous nephritis,	With,	10	2½	43
	Without,	8	3	39
Diffuse nephritis,	With,	3	10	35
	Without,	1	8	55
Interstitial nephritis,	With,	3	11	48
	Without,	2	4	46
Amyloid degeneration,	With,	3	1½	36
	Without,	1	1	59
Passive congestion,	With, .....	..	..	..
	Without,	1	7	63

Above is a table of the average duration of the pulmonary tuberculosis compared with the kidney condition. This duration was not taken from the patient's statement of duration but from the physician's opinion, made after carefully weighing the

history and the physical examination. In this series the diffuse and interstitial nephritis correspond to the cases of the longest duration, but the number of cases studied is too small from which to draw conclusions. For the sake of completeness a column showing the average loss of weight in comparison with the kidney condition is added. This loss is the difference between the patient's highest weight and the last weight before death.

No relation of the occupation to the kidney condition could be discovered. The following table divides the occupations into outside good, outside bad, inside good, inside bad, and housework. We have excluded from these the child of six. Under the head of housework we have included servants and mothers of families. It is to be remembered that these women were all destitute, and therefore mothers would be doing their own housework. In the other four divisions of occupations the occupation of driver was reckoned outside good, that of stevedore outside bad, on account of its laboriousness and the tendency to alcoholism; the occupation of plumber was reckoned inside good, that of dressmaker or clerk inside bad.

	TUBERCLES.	INSIDE GOOD.	INSIDE BAD.	OUT- SIDE GOOD.	OUT- SIDE BAD.	HOUSE- WORK.
Cloudy swelling,	With,	1	..	..	..	..
	Without,....	3	..	..	..	1
Acute parenchymatous nephritis, .	With,	1	6	2	..	3
	Without,....	2	1	..	1	6
Chronic parenchymatous nephritis,	With,	1	3	1	..	3
	Without,....	1	5	2	1	1
Diffuse nephritis,.....	With,	1	1	1	..	..
	Without,....	..	..	1	..	..
Interstitial nephritis,.....	With, .....	..	3	..	..	..
	Without,....	1	1	..	..	..
Amyloid degeneration,	With, .....	..	1	..	..	2
	Without,....	..	..	..	..	1
Passive congestion,	With, .....	..	..	..	..	..
	Without,....	..	1	..	..	..

Nothing new was learned from a study and comparison of the two surgical kidneys. In each case the urine showed numerous

tubercle bacilli. The statement has been made that if tubercle bacilli are found so frequently in the urine in cases of tuberculosis of the lungs, their presence means nothing in the diagnosis of surgical kidney. This statement is not entirely true. In cases of tuberculosis of the lungs the tubercle bacilli are found in the urine in very small numbers, sometimes not more than five or six being found in the centrifugated sediment of many ounces; while in ulcerative tuberculosis of the kidney (surgical kidney) they are found almost as numerous as in the sputum.

Pathogenesis: The nephritis accompanying tuberculosis has been attributed to two different causes, namely, the tubercle bacillus itself (Coffin⁸ and D'Arrigo⁹) and the tuberculous toxin (Leredde,⁶ Grancher and Martin,⁷ and Carriere⁵).

Leredde, in a paper on "Multiple Visceral Necroses in Tuberculosis," begins by assuming that every one admits with Hanot that cirrhosis of the liver may be the result of tuberculosis. In a study of the kidneys in fifteen cases of pulmonary tuberculosis he describes degeneration and necrosis of the epithelium with slight increase in the interstitial tissue. He failed to find tubercle bacilli on staining, and, therefore, attributes the necrosis entirely to the toxin.

Grancher and Martin reported a series of experiments upon dogs for the establishment of immunity with gradually increasing doses of avian tubercle bacilli in which the ultimate outcome frequently was nephritis, either bacillary or toxic. The longer the animal lived and the more resistant it became to tuberculosis, the greater were the chances of nephritis.

Carriere made a study of the kidneys of animals after experimental injections with tuberculin. He describes a special necrosis characterized by fragmentary disintegration of the nuclei, and vacuolar and fatty degeneration of the protoplasm of the epithelium.

Coffin and D'Arrigo found tubercle bacilli in the tissues of the kidneys and make them the cause of the nephritis.



FIG. 9.—A possible healed tubercle in the center of a pyramid. The tubules in it resemble the new tubules seen in hypertrophic cirrhosis of the liver.

From my own studies I am led to believe that tubercle bacilli are excreted in all cases of active tuberculosis. It is possible, however, that many of these bacilli are dead, and that many more have been rendered less virulent by their passage through the circulation. I think it possible, therefore, that the tubercle bacilli are responsible for some of the irritation. That the toxin may set up a very severe nephritis appears likely from the results found in the one private case. This case was practically an arrested case, and from the clinical symptoms it appears evident that the immunization against the disease was the cause of the nephritis.

Following are the details of the studies of seventy-nine cases. In the first sixty the kidneys were studied both macroscopically and microscopically, in the other nineteen only microscopically. The statistics in the preceding pages are entirely from the former.

Case No. 53. Age, thirty-three. Male. White. Entered hospital 2—16—'03. Died 6—25—'03. Physician, Irwin. Clinical diagnosis, phthisis, tuberculous peritonitis. Occupation, plumber's helper. Previous diseases, not recorded. Duration of illness, three years. Weight, highest, one hundred and thirty pounds; on admission, one hundred and nine pounds. Edema, not recorded. Bowels, constipated. Sputum, not recorded. Urine, not recorded. Heart, second pulmonic accentuated. Pulse, 96 to 136; respiration, 24 to 28; temperature, 95° to 101°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs, peritoneum, pleuræ, appendix, and mesenteric glands; chronic parenchymatous nephritis. Heart, normal size, muscle redder and softer than normal. Intestines, not recorded. Kidneys, one and one-half normal size, very pale—almost white; cortex one and one-half normal size.

Macroscopic study: One hundred and forty to one hundred and fifty sections; one tubercle, many miliary cysts.

Microscopic study: Fifteen specimens. Kidney investment normal. Numerous fibrous areas, some of them looking like half-healed tubercles. Four or five local areas of infiltration with round-cells under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, not congested, not vacuolated. Bowman's thickened. Convolute tubules, some dilated, with epithelium atrophic, degenerated, disintegrated,

and necrotic; some not dilated, with epithelium swollen, degenerated, and necrotic. Some hyaline casts with desquamated epithelium about them. Cortex slightly congested. Secretory tubules of medullary rays dilated, epithelium degenerated and necrotic. Interstitial tissue thickened. Pyramids not congested. No tubercles. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis.

Case No. 232. Age, twenty-eight. Male. White. Entered hospital 9—22—'04. Died 9—28—'04. Physician, Stanton. Clinical diagnosis, pulmonary and laryngeal tuberculosis. Occupation, iron worker. Previous disease, influenza, 1890, sick for forty days. Duration of illness, two and one-half years. Weight, highest, one hundred and sixty-five pounds; on admission, one hundred and twenty-eight and three-fourth pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli present. Urine, 9—22—'04, acid, 1020, no albumin, no sugar, no diazo, a few hyaline and granular casts. Heart, vigorous, accentuated pulmonic second. Pulse, 104 to 120; respiration, 20 to 30; temperature, 99° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of left lung, emphysema of right, general pleurisy, fatty liver, congested kidneys. Heart, eight ounces, normal. Intestines, normal. Kidneys, left, seven ounces; right, five ounces; large, dark in color, cut section drips blood; at one pole (left kidney) is a small area, 0.5 cm. in diameter, extending into kidney structure.

Macroscopic study: One kidney cut into seventy sections; three tubercles found.

Microscopic study: Sixty-one specimens. Kidney investment normal. Fibrous areas not recorded. Infiltration under investment not recorded. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, some vacuolated, some congested; one fibroid glomerulus with thickened Bowman's and infiltration about it. Bowman's slightly thickened. One normal Malpighian body with marked infiltration about it, taken macroscopically for a tubercle. Convoluted tubules, epithelium degenerated and necrotic. A few hyaline casts. In areas considerable congestion in glomeruli, cortex, and pyramids; in other specimens no congestion whatever. Interstitial tissue thickened. In the secretory tubules of medullary rays the epithelium is degenerated and necrotic. No amyloid to gentian-violet. No tubercles. Diagnosis, chronic parenchymatous nephritis.

Case No. 236. Age, thirty-two. Male. White. Entered hospital

4-21-'03; discharged from hospital for insubordination 4-21-'04; re-entered 9-1-'04. Died 10-2-'04. Physician, Walsh. Clinical diagnosis, pulmonary tuberculosis, tuberculosis of kidneys, cystitis. Occupation, gardener, laborer. Previous disease, pneumonia in 1895. Duration of illness, over eight years. Weight, highest, one hundred and forty pounds; on admission, one hundred and twenty-four pounds; 9-21-'04, one hundred and eight and one-half pounds. No edema. Bowels, constipated up to one month before death, then loose. Sputum, tubercle bacilli positive. Urine, 7-14-'03, trace of albumin, no sugar, many pus-cells, no casts; 9-3-'04, cloudy white precipitate, albumin present, no sugar, diazo negative, hyaline and granular casts, pus in great quantities, epithelial cells, and tubercle bacilli. Three or four months previous to death the diagnosis of tuberculosis of the left kidney (that is, surgical kidney) was made. Heart, drawn somewhat to right, accentuated second sound. Pulse, 90 to 100; respiration, 25 to 30; temperature, 98° to 100°.

Autopsy, Rosenberger. Pathological diagnosis, fibroid tuberculosis of right lung, ulcerative tuberculosis of both lungs, chronic parenchymatous nephritis of right kidney, ulcerative tuberculosis of left kidney, cystitis, amyloid spleen. Liver congested and shows calcified tubercles. Heart, seven ounces, otherwise normal. Intestines, normal. Kidneys, left, seven ounces, enlarged, shows three large ulcerated areas averaging 3 cm. in diameter, each surrounded with fibrous tissue; right, enlarged, swollen, pale.

Macroscopic study: Left kidney riddled with large tuberculous cysts (surgical kidney); right cut into seventy sections; three or four tubercles found, one small cyst.

Microscopic study: Thirty-eight specimens. Kidney investment normal. Many typical fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli markedly swollen, so that Bowman's and glomerulus look to be one piece; again the space between them is filled with detritus, again with blood; glomeruli swollen, cloudy, congested, vacuolated, many fibroid, sometimes show an appearance like amyloid, again whole glomeruli broken up, looking like a mass of debris. Bowman's thickened. Convoluted tubules, epithelium shows extensive and wide-spread degeneration and necrosis. Innumerable hyaline casts; many cellular casts; many granular casts. In the secretory tubules of medullary rays the epithelium is swollen and necrotic. Interstitial tissue generally thickened, especially so under investment. Considerable infiltration between tubules. Cortex generally congested. Pyramids congested. Some tubules filled with red blood-corpuscles, again with white blood-corpuscles. No amyloid to gentian-violet. Diagnosis, right kidney, diffuse nephritis; left, ulcerative tuberculosis.

Case No. 282. Age, forty-five. Male. White. Entered hospital 3—18—'04. Died 8—24—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of lungs with cavity in each upper lobe, serous effusion over right lower lobe, myocarditis and dilated right heart, arteriosclerosis. Occupation, laborer. Previous diseases, typhoid, 1899; pleurisy, 10—'03, at White Haven; scarlet fever at fourteen; gas-poisoning, 1901. Duration of illness, probably years. Weight, highest, not known; on admission, one hundred and twenty-three and one-half pounds; 8—9—'04, one hundred and fifteen pounds. Edema of feet, 1—'04, not at time of admission. Bowels, very loose. Sputum, tubercle bacilli positive. Urine, trace of albumin, otherwise negative; diazo negative; hyaline and many granular casts. Heart sounds weak, right heart dilated. Pulse, 60 to 140; respiration, 20 to 44; temperature, 96° to 102°.

Autopsy. Rosenberger. Pathological diagnosis, fibroid tuberculosis of both lungs, the right markedly compressed by pyothorax, cavity without infiltration right upper lobe, with infiltration of left lower lobe, obliterative pericarditis, parenchymatous nephritis. Heart, eleven ounces; position, shape, and size normal, muscle pale. Intestines, normal. Kidneys, left, seven and one-half ounces; right, seven and one-half ounces; very much enlarged; large cyst, size of horse-chestnut, in cortex under investment of left kidney; cortex pale and thickened, several tubercles.

Macroscopic study: Number of sections not recorded; numerous apparent tubercles, numerous small cysts, one large cyst.

Microscopic study: Thirty-four specimens. Kidney investment normal. Numerous fibrous areas. Several areas of infiltration looking like young tubercles, 0.5 to 1 mm. in diameter. In these areas Bowman's is markedly thickened and the tubules contain hyaline casts. One or two Malpighian bodies a little nearer to investment than normally. Glomeruli normal or slightly contracted, congested, sometimes vacuolated, several hyaline, one to two lines space. Bowman's generally thickened. Convoluted tubules generally dilated, epithelium markedly degenerated and necrotic. Secretory tubules of medullary rays same. Cortex generally congested. Interstitial tissue thickened near investment. Pyramids congested. No typical tubercles found, but it is very likely that many of the infiltrations represent young tubercles. These were taken for tubercles macroscopically. One small area containing markedly thickened connective tissue appears like a healed tubercle. Hyaline and granular casts and one leucocytic cast. One specimen stained with carbol-fuchsin but no tubercle bacilli found. Diagnosis, chronic parenchymatous nephritis, possible tubercles.

Case No. 501. Age, fifty-three. Male. White. Entered hospital 9—2—'04. Died 9—10—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of the lungs. Occupation, weaver, fireman. Previous diseases, typhoid, 1870; influenza, 1902; pleurisy, 1900. Duration of illness, four years. Weight, highest unknown; on admission, seventy pounds. No edema. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 9—2—'04, acid, 1026, no sugar, diazo positive, trace of albumin, hyaline and granular casts, uric-acid crystals. Heart, normal in size, sounds weak, radial arteries like pipe-stems. Pulse, 60 to 120; respiration, 27 to 40; temperature, 95° to 100°.

Autopsy, Walsh. Pathological diagnosis, anthracosis of both lungs, ulcerative and miliary tuberculosis of the lungs, fatty liver, interstitial nephritis, pigmentation of spleen. Heart, seven ounces, normal in every way except slight thickening of the mitral valve. Intestines, normal. Kidneys, left, four ounces; right, four ounces; small, pale, firm, show increase of fat in pelvis; right shows one small yellowish area resembling miliary tubercle.

Macroscopic study: Number of sections not stated; quite a number of tubercles.

Microscopic study: Twenty-four specimens. Kidney investment normal. Several typical fibrous areas. Several areas of infiltration under investment. Several Malpighian bodies closer to investment than normally. Glomeruli swollen, not cloudy, slightly vacuolated, not congested, occasionally fibroid; one to two lines space. Bowman's usually thickened. Convolted tubules, epithelium swollen, cloudy, shows not much degeneration or necrosis. Secretory tubules of medullary rays the same. Cortex not congested. Interstitial tissue thickened. Hyaline casts in cortex. A few microscopic cysts filled with hyaline material. Pyramids not congested, show hyaline casts. Four typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, interstitial nephritis, scattered tubercles.

Case No. 551. Age, nineteen. Female. White. Entered hospital 4—27—'04. Died 11—20—'04. Physician, Ravenel. Clinical diagnosis, pulmonary tuberculosis. Occupation, servant girl. Previous disease, typhoid in 1902. Duration of illness, one year. Weight, highest before admission, ninety-eight pounds; lowest recent weight, ninety-eight pounds; on admission, one hundred and twelve and one-half pounds; 11—8—'04, one hundred and one and three-fourth pounds. No edema. Bowels, loose. Sputum, tubercle bacilli present. Urine, 5—9—'04, negative. Heart, very poor first sound, second pulmonic accentuated, normal in size and position. Pulse, 100 to 120; respiration, 24; temperature, 98° to 100°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis

of both lungs, emphysema, edema, bronchopneumonia, a few miliary tubercles, nephritis, peritonitis, congestion of intestines, red atrophy of liver, enlarged bronchial glands, dilatation of jugular veins. Heart, right side dilated, otherwise normal. Intestines, congested. Kidneys, left, six ounces; firm, normal in size; on section, pyramids purplish, cortex striated, no amyloid; right, four ounces, smaller than left.

Macroscopic study: One hundred and forty to one hundred and fifty sections; one tubercle, one-half size of pea.

Microscopic study: Twenty-four specimens. Kidney investment normal. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli slightly swollen, some vacuolated, cloudy, slightly congested, no space. Bowman's not thickened. Convoluted tubules, epithelium swollen, degenerated, and sometimes necrotic. In the secretory tubules of medullary rays the epithelium is swollen, no necrosis. Interstitial tissue not thickened. Cortex not congested. Pyramids not congested. One small area, about 0.75 mm., of round-cell infiltration between cortex and medulla, probably a young tubercle. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 714. Age, twenty-seven. Male. White. Entered hospital 5—25—'04. Died 9—27—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of lungs. Occupation, machinist. Previous diseases, not stated. Duration of illness, six months. Weight, highest, one hundred and forty-eight and one-half pounds; on admission, one hundred and eleven and one-fourth pounds; 7—24—'04, ninety-five and one-half pounds. Edema not recorded. Bowels, regular up to three months before death, then constipated; one week before death, loose. Sputum, tubercle bacilli positive. Urine, 6—11—'04, acid, 1026, no albumin, no sugar, no diazo. Heart, second pulmonic accentuated. Pulse, 90 to 140; respiration, 22 to 52; temperature, 96° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, pneumothorax, pyothorax, emphysema of right lung, miliary tuberculosis and edema of lungs, congestion of liver, parenchymatous nephritis and tubercles in kidney, amyloid spleen. Heart, nine ounces, displaced to right, markedly dilated, shape normal, slightly enlarged, muscle reddish in color and flabby. Intestines, normal. Kidneys, left, four and one-half ounces, normal size, contains one small area resembling a tubercle in the cortex; right, four ounces, smaller than left, no tubercles found.

Macroscopic study: One hundred and forty to one hundred and fifty sections; many tubercles found.

Microscopic study: Sixty specimens. Kidney investment normal. Several typical fibrous areas. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, not congested, not vacuolated, one line space. Bowman's normal. Convoluted tubules, epithelium swollen, cloudy, degenerated, disintegrated, and necrotic. In the secretory tubules of medullary rays the epithelium is disintegrated, degenerated, and necrotic. Hyaline casts under investment, a few generally throughout cortex. Many tubules filled with white blood-cells. Cortex not congested. Interstitial tissue thickened; sometimes cellular infiltration takes the place of the thickened connective tissue. Pyramids somewhat congested. One-half dozen tubercle bacilli found in small fibrous area near investment, some of them in hyaline casts, some of them in epithelium of the tubules in which casts lay. Tubercle bacilli were also found in other fibrous areas. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, diffuse nephritis, scattered tubercles, tubercle bacilli in various parts of kidney.

Case No. 945. Age, thirty-two. Female. White. Entered hospital 2-1-'04. Died 8-8-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, dressmaker since thirteen. Previous diseases, typhoid and smallpox at age of nine. Duration of illness, one year. Weight, highest, one hundred and twenty-seven pounds; on admission, one hundred and four and one-half pounds; 6-27-'04, eighty-nine and one-fourth pounds. Edema, slight, of feet. Bowels, regular for one month after entrance, then very loose until death. Sputum, tubercle bacilli numerous. Urine, 2-2-'04, 1024, no sugar, albumin faint trace; 3-20-'04, acid, 1030, no albumin, no sugar, diazo doubtful. Heart, normal. Pulse, 70 to 120; respiration, 20 to 40; temperature, 95° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy, ulcerative tuberculosis and emphysema of both lungs, fatty kidneys, double ureters, accessory spleen, enlarged mesenteric glands, tuberculous ulcers of intestines. Heart, five and one-half ounces, small, muscle firm, normal in color. Intestines, colon contains a few typical tuberculous ulcers; ileum contains a few typical small ulcers. Kidneys, left, six ounces, large, pale, presents two ureters fusing into one 10 cm. below pelvis; upon cut section organ is very pale, presents fatty appearance; in the pelvis there is an excess of adipose tissue; right, six and one-half ounces, shows same conditions as left except ureters enter bladder separately.

Macroscopic study: One hundred and forty to one hundred and fifty sections; several tubercles in each organ.

Microscopic study: Twelve specimens. Kidney investment normal.

One large fibrous area connecting with a tubercle below. This shows the glomeruli and Bowman's sometimes fibroid, again the glomeruli healthy, but Bowman's markedly thickened; hyaline casts in abundance; the blood-vessels large, though there are no blood-vessels in the tubercle. Malpighian bodies normally distant from the investment. Glomeruli swollen, cloudy, not congested, not vacuolated, a few fibroid; no space. Bowman's not thickened. Convoluted tubules, epithelium swollen, cloudy, degenerated, disintegrated, and necrotic. Secretory tubules of medullary rays same except not so necrotic. Interstitial tissue normal. Pyramids slightly congested. Large typical tubercle in cortex with caseation and giant-cells; tubercles show hyaline casts. No amyloid to gentian-violet. Mounted in celloidin and paraffin, stained with hematoxylin and eosin and van Gieson's. Diagnosis, acute parenchymatous nephritis, tubercles.

Case No. 1032. Age, twenty-seven. Male. White. Entered hospital 8—9—'04. Died 9—10—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of the lungs, pleuræ, and intestines. Occupation, coppersmith. Previous disease, measles. Duration of illness, one year. Weight, highest, one hundred and forty-five pounds; on admission, not recorded; 8—23—'04, ninety-one pounds. Edema, present, but location not recorded. Bowels, loose. Sputum, not recorded. Urine, 7—10—'04, no albumin, no sugar, no casts. Heart, dullness increased upward and to right, second pulmonic accentuated. Pulse, 100 to 120; respiration, 26 to 32; temperature, 97° to 100°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs with emphysema, pleurisy, fatty kidneys, amyloid spleen, congestion of liver. Heart, normal. Intestines, normal. Kidneys, left, eight ounces; right, five ounces; slightly larger than normal, pale, several tubercles.

Macroscopic study: Number of sections not recorded; two tubercles.

Microscopic study: Twenty-eight specimens. Kidney investment normal. Several typical fibrous areas. Some infiltration under investment. A number of Malpighian bodies closer to investment than normally. Glomeruli cloudy, swollen, congested, not vacuolated, usually less than one line space. Bowman's thickened. Convoluted tubules, epithelium very transparent, swollen, cloudy, necrotic (necrosis is wide-spread). Some infiltration into tubules. Interstitial tissue thickened. Secretory tubules of medullary rays same as convoluted tubules. Cortex not congested. Pyramids congested. A few hyaline casts. Three typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, scattered tubercles.

Case No. 1297. Age, sixty-four. Male. White. Entered hospital 8—21—'03. Died 12—14—'03. Physician, Walsh. Clinical diagnosis, pulmonary tuberculosis. Occupation, baker. Previous diseases, rheumatism, 1889; pneumonia, six times. Duration of illness, ten years. Weight, highest, one hundred and sixty-eight pounds; on admission, one hundred and seven pounds. No edema. Bowels, regular. Sputum, tubercle bacilli negative. Urine, 1040, no sugar, no albumin, no diazo. Heart sounds weaker than normal. Pulse, 70 to 140; respiration, 20 to 30; temperature, 95° to 100°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs, both pleura, cysts of left kidney. Heart, somewhat smaller than normal, muscle pale in color, slight sclerosis of aorta. Ileum contains one small ulcer, rest of intestines normal. Kidneys, right, larger than normal, pale, cortex increased in size; left, slightly larger than normal, and presents two rather large cysts located at opposite ends of the organ; cortex about normal.

Macroscopic study: Left kidney cut into seventy-two sections; no tubercles, many large and small cysts, largest, size of hazel-nut.

Microscopic study: Seven specimens. Kidney investment normal. Several fibrous areas showing considerable fibrous tissue. A few localized areas of infiltration. Malpighian bodies normally distant from investment. Glomeruli congested, not cloudy, not vacuolated, normal in size, several fibroid, two to three lines space. Bowman's thickened. Convoluted tubules generally dilated, especially in two outer layers, the epithelium atrophic, degenerated, disintegrated, and necrotic; in the inner layer, near pyramids, the lumen is small, the epithelium is swollen, degenerated, cloudy, and somewhat necrotic. In the secretory tubules of the medullary rays the epithelium is somewhat atrophied, disintegrated, and necrotic; the lumen slightly dilated and filled with debris. Cortex somewhat congested. Considerable local thickening of interstitial tissue, slight general thickening. Pyramids congested. No tubercles found. No amyloid to gentian-violet. Mounted in celloidin and paraffin, stained by hematoxylin and eosin and van Gieson's. Diagnosis, chronic parenchymatous nephritis, local areas of interstitial nephritis.

Case No. 1577. Age, twenty-seven. Female. White. Entered hospital 10—27—'03. Died 7—11—'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis, tuberculous enteritis, peritonitis, appendicitis, pericarditis, parenchymatous nephritis. Occupation, housework. Previous diseases, typhoid during two months before admission; malaria, 1897; pleurisy with typhoid pneumonia in childhood. Duration of illness, one year.

Bowels, constipated. Edema, marked in both feet. Weight, highest, one hundred and forty-one pounds; on admission, one hundred and eighteen pounds; 6—16—'04, eighty-eight pounds. Sputum, not recorded. Urine, 1018, no albumin, diazo positive. Heart sounds rapid, no murmurs. Pulse, 90 to 130; respiration, 24 to 44; temperature, 98° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of left lung, miliary tuberculosis of right lung with pneumonia, fatty amyloid spleen, tuberculous appendicitis, miliary tubercles in right kidney, adhesive pericarditis, ulcers in cecum. Heart, eight and one-half ounces, displaced upward, slightly enlarged, slightly flabby, paler than normal. Ileum contains small, irregular ulcerations, not typical of tuberculosis. The cecum contains numerous ulcers, rest of intestines normal. Kidneys, left, five and one-half ounces; right, seven ounces; both show parenchymatous changes; several tubercles found.

Macroscopic study: One hundred and forty-four sections; several tubercles, several small cysts.

Microscopic study: Eighteen specimens. Kidney investment normal. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, congested, not vacuolated, rarely show small mass of hyaline material. Bowman's slightly thickened. No infiltration about Bowman's. Convoluted tubules, generally swollen, epithelium slightly swollen, cloudy, degenerated, sometimes disintegrated, rarely necrotic. Several areas of local infiltration resembling young tubercles. No congestion. No casts. No infiltration. Interstitial tissue not thickened. Pyramids congested. Amyloid to gentian-violet. Three tubercles with caseation and giant-cells—two in cortex, one in medulla; also several apparently young tubercles. Diagnosis, amyloid degeneration, scattered tubercles.

Case No. 1896. Age, thirty-three. Female. White. Entered hospital 2—1—'04. Died 2—9—'04. Physician, Flick. Clinical diagnosis, tuberculosis of the lungs. Occupation, housework. Previous diseases, not stated. Duration of illness, three months. Weight, highest, one hundred and twenty pounds; on admission, ninety-six and one-half pounds. No edema. Bowels, diarrhea. Sputum, not examined. Urine, not examined. Heart, very rapid, no murmurs. Pulse, 110 to 120; respiration, 28 to 34; temperature, 99° to 102°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs, purulent pleurisy, tuberculous appendicitis, fatty degeneration of kidneys, tuberculosis of bronchial and mesenteric glands. Heart, seven and one-half

ounces, one inch beyond sternum to right, but right lung covers it to right edge of sternum; shape and size normal; left ventricle slightly larger than normal, but muscle not thickened; right ventricle normal; wall somewhat thin. Ileum shows in places aggregations of small tubercles on peritoneal surface and several small ulcers; rest of intestines normal. Kidneys, left, four and three-fourth ounces; right, five ounces; normal in size, very pale in color.

Macroscopic study: One kidney cut, ninety sections; one positive tubercle, two suspicious tubercles.

Microscopic study: Ten specimens. Kidney investment thickened. No fibrous areas. Several small areas of infiltration under investment. Malpighian bodies normally distant from capsule. Glomeruli swollen, cloudy, not congested, not vacuolated, several fibroid, one line space. Bowman's slightly thickened. In the convoluted tubules the epithelium is swollen, cloudy, disintegrated, not necrotic. Cortex not congested. Rare hyaline casts. Secretory tubules of medullary rays quite normal. Interstitial tissue not thickened. Pyramids not congested. One small cyst in pyramid, 0.5 mm. in diameter, filled with pink hyaline material. No amyloid to gentian-violet. Diagnosis, cloudy swelling.

Case No. 2046. Age, thirty-one. Male. White. Entered hospital 6—7—'04. Died 6—28—'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of the lungs. Occupation, driver. Previous diseases, typhoid, 1895; measles; pertussis. Duration of illness, two years. Weight, highest, one hundred and sixty-eight pounds; on admission, one hundred and fifty-three and one-half pounds; 6—14—'04, one hundred and forty-two and one-half pounds. No edema. Bowels, regular. Sputum, tubercle bacilli present. Urine, 6—15—'04, amber, 1020, no sugar, trace of albumin, diazo slight. Heart, no murmurs, rapid. Pulse, 90 to 140; respiration, 18 to 40; temperature, 95.4° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, emphysema of both lungs, ulcerative tuberculosis of right lung, miliary tuberculosis of both lungs, hypertrophy of heart, congested liver, parenchymatous nephritis, enlarged mesenteric glands. Heart, ten ounces, position and shape normal, slightly enlarged, muscle firm, contracted, left ventricular wall thickened. Intestines, apparently normal. Kidneys, left, seven and one-half ounces, enlarged, congested, striated cortex; right, six and one-fourth ounces, smaller than left, same changes.

Macroscopic study: One hundred and forty sections; both kidneys very large, congested, seven tubercles, two small cysts.

Microscopic study: One hundred and twenty specimens. Kidney investment normal. Several typical fibrous areas with hyaline casts. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli congested, not cloudy, swollen, some vacuolated, one line space. Bowman's epithelium normal; connective tissue slightly thickened, no infiltration about. Convoluted tubules dilated and filled with debris, epithelium degenerated, disintegrated, and necrotic. Interstitial tissue generally normal. No casts. No infiltration. In the secretory tubules of medullary rays the epithelium is somewhat atrophic, sometimes degenerated, not necrotic. Pyramids congested. No amyloid to gentian-violet. One large cyst, evidently of a tubule, though the wall is so much flattened out that the cells cannot be seen. Another large and another small cyst, all three in cortex. Some glomeruli in wall of cyst show thickening of Bowman's capsule, also some infiltration in wall. These cysts might appear like tubercles macroscopically. One localized overgrowth of fibrous tissue, 1 mm., in medulla, which would look like a tubercle macroscopically. Diagnosis, chronic parenchymatous nephritis.

Case No. 2102. Age, eighteen. Male. White. Entered hospital 9-5-'04. Died 9-9-'04. Physician, McCarthy. Clinical diagnosis, pulmonary and laryngeal tuberculosis. Occupation, bookkeeper. Denies all previous diseases. Duration of illness, fifteen months. Weight, highest, one hundred and thirty-four pounds; on admission, one hundred and twenty-five and three-fourth pounds. No edema. Bowels, regular. Sputum, tubercle bacilli positive. Urine, 1022, albumin, diazo positive. Heart, normal. Pulse, 104 to 132; respiration, 28 to 36; temperature, 99.4° to 101.4°.

Autopsy, Rosenberger. Pathological diagnosis, recent pleurisy, ulcerative tuberculosis of both lungs, miliary tuberculosis and emphysema of both lungs, amyloid spleen and liver, enlarged and calcareous mesenteric glands, tuberculous enteritis and appendicitis. Heart, six and one-half ounces, normal, muscle pale. Ileum contains a few small ulcers, rest of intestines normal. Kidneys, left, five ounces, pale, flabby, no tubercles, no amyloid reaction; right kidney, four ounces, slightly smaller than left.

Macroscopic study: One hundred and forty to one hundred and fifty sections; markedly mottled and fatty to the naked eye, numerous tubercles.

Microscopic study: Twenty-six specimens. Kidney investment normal. Several fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli sometimes congested, swollen, cloudy, not vacuolated, quite a few glomeruli with hyaline change, yet no amy-

loid to gentian-violet; this hyaline change shows somewhat of a fibrous character. Bowman's thickened. Convolute tubules, the epithelium usually more transparent than normally, swollen, degenerated, and sometimes disintegrated, some necrosis. Cortex congested. Numerous hyaline casts. Pyramids congested. Interstitial tissue thickened and undergoing hyaline change. Numerous tubercles with caseation and giant-cells all in cortex. Diagnosis, beginning amyloid degeneration, scattered tubercles.

Case No. 2180. Age, forty-two. Female. White. Entered hospital 3-31-'04. Discharged 5-12-'04. Readmitted 7-16-'04. Died 10-27-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, housework. Previous disease, rheumatism, 1888. Duration of illness, two years. Weight, highest unknown; on admission, one hundred pounds; 5-25-'04, ninety-seven and three-fourth pounds. No edema. Bowels, very loose. Sputum, tubercle bacilli present. Urine, 7-19-'04, acid, yellow, albumin, diazo positive, no sugar. Heart, 3-31-'04, sounds poor in quality, systolic murmur at pulmonary area; 7-27-'04, second pulmonic accentuated, systolic murmur at pulmonic, also at apex; mitral murmur, probably hemic. Pulse, 90 to 110; respiration, 30 to 40; temperature, 98° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy of both sides, tuberculosis of both lungs, caseous pneumonia of right lung, congestion of liver, mitral valvulitis, parenchymatous nephritis, atheroma of aorta and splenic artery, capsulitis of spleen and liver, appendicitis. Heart, displaced to left, mitral valve markedly thickened, fenestration of the middle aortic leaflet, chordæ tendineæ of mitral also thickened. Ileum much congested, no ulcers present, rest of intestines normal. Kidneys, left, five ounces, slightly enlarged, slightly congested, two small areas, apparently tubercles; right, four ounces, paler than left, firm in consistence.

Macroscopic study: Number of sections not recorded; three tubercles found in one small piece.

Microscopic study: Thirteen specimens. Kidney investment normal. Several fibrous areas. No infiltration under investment. Some Malpighian bodies pretty close to investment (0.12 mm.). Glomeruli swollen, congested, not vacuolated, one fibroid glomerulus, one to two lines space. Bowman's sometimes thickened. Convolute tubules near investment dilated, epithelium atrophic, degenerated, necrotic; tubules in middle and inner layer epithelium swollen, cloudy, degenerated, and necrotic. Hyaline casts in cortex, but practically only under investment. Cortex congested. Secretory tubules of medullary rays dilated, epithelium degenerated. Interstitial tissue not thickened. Pyramids slightly congested. One or two hyaline casts in pyramids.

Typical tubercles with caseation and giant-cells, two in cortex, one in pyramid. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2213. Age, eighteen. Male. White. Entered hospital 6—8—'04. Died 6—13—'04. Physician, Cummins. Clinical diagnosis, pulmonary tuberculosis. Occupation, tailor. Previous diseases, pleurisy (?), measles, and pertussis. Duration of illness, nine months. Weight, highest, one hundred and five pounds; on admission, ninety-three and one-half pounds. No edema. Bowels, regular. Sputum, tubercle bacilli positive. Urine, 1020, acid, no albumin, no sugar, diazo positive. Heart, rapid and feeble. Pulse, 110 to 140; respiration, 36 to 42; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, miliary and ulcerative tuberculosis of both lungs with cavity formation, tuberculous pneumonia, fatty infiltration of liver, acute congestion of kidneys, enlarged mesenteric glands. Heart, six ounces, normal. Intestines, normal. Kidneys, left, six and one-half ounces; right, five ounces; slightly swollen, striated cortex, pyramids purplish in color.

Macroscopic study: Seventy sections; one positive tubercle, two apparent tubercles.

Microscopic study: Twenty-six specimens. Kidney investment not present. Fibrous areas not recorded. Glomeruli swollen, cloudy, not vacuolated, not congested, no space. Bowman's thickened; no infiltration about. Convoluted tubules sometimes dilated, epithelium swollen, degenerated, and necrotic. Cortex not congested. Several hyaline casts. Secretory tubules of medullary rays swollen, cloudy, and frequently necrotic. Interstitial tissue thickened. Pyramids not congested. Two tubercles found in cortex, one typical, with caseation and giant-cells. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, tubercles.

Case No. 2252. Age, twenty. Male. White. Entered hospital 3—31—'04. Died 6—24—'04. Physician, Stanton. Clinical diagnosis, acute miliary tuberculosis. Occupation, furniture packer, eight months; laborer previous to this. Previous disease, typhoid. Duration of illness, six weeks. Weight, highest, one hundred and sixty pounds; on admission, one hundred and fifty-five pounds; 5—16—'04, one hundred and five and one-half pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli present (4—4—'04). Urine, 4—4—'04, diazo positive; 5—29—'04, no albumin, no sugar; 6—1—'04, diazo positive, no albumin, sugar, or casts.

Heart, area of dulness enlarged, diffuse pulsation, apex apparently in fifth interspace, no murmurs. Pulse, 80 to 140; respiration, 18 to 40; temperature, 95° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, bronchiectasis, parenchymatous nephritis, enlarged mesenteric glands, small ulcers in appendix, pleurisy, fatty liver. Heart, fifteen ounces, position and shape normal, slightly enlarged, muscle firm, rather pale. Intestines, normal. Kidneys, parenchymatous nephritis.

Macroscopic study: Fifty sections; two tubercles, both in cortex.

Microscopic study: Fourteen specimens. Kidney investment normal. Several typical fibrous areas with hyaline casts. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, sometimes one line space, sometimes congested, usually not congested, not vacuolated. Bowman's not thickened; one area of infiltration about Bowman's. Convoluted tubules sometimes dilated, epithelium swollen, disintegrated, some necrosis. No thickening of interstitial tissue except in fibrous areas, and then marked thickening. Casts entirely in fibrous areas. No infiltration between tubules. In the secretory tubules of medullary rays the epithelium is swollen, degenerated, and somewhat necrotic. Pyramids not congested. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2262. Age, fifty-seven. Male. White. Entered hospital 4-5-'04. Died 6-13-'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis, tuberculous enteritis. Occupation, cook, oyster-opener. Previous diseases, rheumatism off and on for ten years; influenza, 1889; bronchitis, ever since. Duration of illness, since 1889. Weight, highest, one hundred and twenty pounds; on admission, seventy-nine pounds; 5-3-'04, seventy-nine pounds. No edema. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 1028, albumin in slight quantities, no sugar. Heart, normal, distinct accentuation of pulmonic second sound. Pulse, 100 to 120; respiration, 24 to 30; temperature, 98° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, miliary tuberculosis of both lungs, pleurisy, most marked on left side, parenchymatous nephritis, fatty liver with possible red atrophy, tuberculosis of mesenteric glands, bedsores. Heart, four and one-half ounces, pale, normal in shape and size. Intestines, normal. Kidneys, left, five ounces, slightly enlarged, pale; right, five and

one-quarter ounces, cortex thickened, medulla purplish, stellate veins prominent, surface smooth.

Macroscopic study: Fifty sections; tubercles, small cyst.

Microscopic study: Twenty-two specimens. Kidney investment normal. Several typical fibrous areas. Infiltration under investment with nine fibroid Malpighian bodies and hyaline casts. Some Malpighian bodies closer than normal to investment. Glomeruli not congested, slightly vacuolated, swollen, a few fibroid, two fibroid close to investment, one to two lines space. Bowman's thickened, no infiltration about. Convoluted tubules dilated, epithelium atrophic, degenerated, disintegrated, necrotic. A few hyaline casts, some infiltration between tubules. Secretory tubules of medullary rays the same. Interstitial tissue thickened. Cortex not congested. Pyramids not congested. No amyloid to gentian-violet. Several tubercles; one typical tubercle with caseation and giant-cells in cortex. Mounted in celloidin and paraffin, stained with hematoxylin and eosin and van Gieson's. Diagnosis, beginning interstitial nephritis, scattered tubercles.

Case No. 2289. Age, fourteen. Male. White. Entered hospital 4—15—'04. Died 6—25—'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis, right-sided pneumothorax. Occupation, worked as a florist's boy for eight months. Previous diseases, measles and whooping-cough. Duration of illness, one year. Weight, highest, ninety pounds; on admission, seventy-eight pounds; 5—8—'04, seventy-six and one-quarter pounds. No edema. Bowels, regular up to one month before death, then very loose. Sputum, tubercle bacilli present. Urine, 4—18—'04, acid, 1020, no albumin, no sugar; 6—1—'04, alkaline, no albumin, no sugar, many phosphates, no casts, diazo positive. Heart not enlarged, first sound strong, second pulmonic slightly loud, no murmur, pulsation visible over entire area of dulness. Pulse, 90 to 140; respiration, 28 to 40; temperature, 96° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, pneumothorax (right side), ulcerative tuberculosis of both lungs, parenchymatous nephritis, pleurisy with adhesions, tuberculous enteritis, enlarged mesenteric glands, fatty liver. Heart, five and one-half ounces, shape and size normal, displaced to right side, muscle pale and flabby. Ileum contains a few ulcers; cecum congested and eroded. Kidneys, left, five and one-half ounces, parenchymatous nephritis; right, four and one-half ounces, smaller than left, shows several small infarcts, otherwise same changes as left.

Macroscopic study: One kidney cut into fifty sections; one tubercle in center of pyramid.

Microscopic study: Forty-seven specimens. Kidney investment normal. Fibrous areas not recorded. Infiltration under investment not recorded. Malpighian bodies normally distant from investment. Glomeruli congested, swollen, not cloudy, not vacuolated, one hyaline fibroid, one, two, or three lines space. Bowman's not thickened, no infiltration about. Convoluted tubules, epithelium swollen, cloudy, degenerated, necrotic, disintegrated. No infiltration between tubules. Secretory tubules of medullary rays the same. No thickening of interstitial tissue. Marked congestion of pyramids. One area of markedly thickened connective tissue looking like old tubercle. It is not a fibroma, because it has no capsule, and there are several tubules running through it. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 2344. Age, thirty-five. Female. White. Entered hospital 5-12-'04. Died 8-10-'04. Physician, Norris. Clinical diagnosis, tuberculosis of both lungs; tuberculous enteritis. Occupation, housework. Previous diseases, diseases of children; serious colds at different times. Duration of illness, one year. Weight, highest, one hundred and fifty pounds; on admission, one hundred and four pounds; 7-12-'04, ninety-one and one-half pounds. No edema. Bowels, regular first month in hospital, rest of time diarrhea. Sputum, tubercle bacilli positive. Urine, clear, 1020, acid, trace of albumin. Heart, normal. Pulse, 100 to 110; respiration, 32; temperature, 98° to 101°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, pleurisy of both sides, fatty kidneys, congested liver, enlarged mesenteric glands, congested ileum. Heart, eight ounces, somewhat enlarged and flabby. Ileum, congested. Kidneys, left, four ounces; right, five ounces; small, pale, no tubercles visible macroscopically.

Macroscopic study: One hundred and fifty sections; double ureters, numerous small cysts filled with brown, gelatinous material, four suspicious tubercles found.

Microscopic study: Forty-five specimens. Kidney investment normal. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, not congested, not vacuolated, markedly amyloid, no space. Bowman's thickened and hyaline degenerated. Convoluted tubules dilated, almost cystic, and practically all filled with hyaline casts or with white blood-cells; epithelium atrophic, not degenerated, not necrotic; where not dilated, the epithelium

is frequently degenerated, swollen, disintegrated, and sometimes necrotic. Secretory tubules of medullary rays are dilated, the epithelium atrophic. Innumerable hyaline casts everywhere throughout cortex and pyramids. Cortex not congested. Marked thickening of interstitial tissue, much of which has become hyaline. Pyramids not congested. The suspicious tubercles were a cyst in the pyramid and three areas of round-celled infiltration; two of these areas were at the junction of the cortex and pyramids and one in the cortex. All three appeared like young tubercles. Mounted in celloidin and paraffin, stained with hematoxylin and eosin and van Gieson's. Amyloid to gentian-violet. Diagnosis, amyloid degeneration.

Case No. 2347. Age, thirty-nine. Male. White. Entered hospital 5-3-'04. Died 6-10-'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of the lungs. Occupation, steam engineer. Previous diseases, measles (child); influenza, 1901. Duration of illness, three years. Weight, highest, one hundred and forty-six pounds; on admission, one hundred and fifteen and one-quarter pounds; 5-17-'04, one hundred and thirteen and one-half pounds. Edema, formerly, not at time of entrance. Bowels, constipated. Sputum, tubercle bacilli present. Urine, negative as to albumin and sugar. Heart, area of dulness increased to left and upward, at pulmonary area ringing accentuated second sound and doubtful systolic murmur. Pulse, 90 to 140; respiration, 36; temperature, 97° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, tuberculosis of both lungs with bronchiectasis in left lung, thickened pleuræ, fibroid pneumonia, fatty kidney, fibroid adrenal (left), calcification of splenic artery, fatty infiltration of liver, ulcers in cecum. Heart, nine and one-half ounces, slightly enlarged, muscle fairly normal in color, ventricular walls slightly thickened, milk spot on right ventricle, fatty change also present. Intestines, a few ragged and irregular ulcers in cecum, otherwise normal. Kidneys, pale in color, slight fatty change.

Macroscopic study: One hundred and fifty sections; one small cyst and tubercles.

Microscopic study: Ninety-three specimens. Kidney investment thickened. Interstitial tissue under investment thickened. Several fibrous areas. Some infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli not congested, vacuolated, swollen, cloudy, many fibroid. Bowman's thickened, especially about fibroid glomeruli and in fibrous areas. Round-cell infiltration about Bowman's capsule, especially in fibrous areas and about fibroid glomeruli. Convoluted tubules in outer layer dilated, rarely small tubular cysts, lumina large, empty, epithe-

lium atrophic, degenerated, necrotic (necrosis wide-spread). Interstitial tissue thickened by extensions from investment. Occasional infiltration between tubules. Blood-vessels normal. A rare hyaline cast. In the middle layer the convoluted tubules dilated, several cystic; epithelium is sometimes swollen, sometimes atrophic, degenerated, and somewhat necrotic. Interstitial tissue increased, some infiltration between tubules; blood-vessels normal. A few hyaline casts. Convoluted tubules between medullary rays not dilated, epithelium swollen, degenerated, somewhat necrotic. Interstitial tissue here and there increased. In the secretory tubules of medullary rays the epithelium is swollen, degenerated, disintegrated, and necrotic. Pyramids normal. No amyloid to gentian-violet. One-half dozen tubercles found in cortex, some typical with caseation and giant-cells. Diagnosis, chronic parenchymatous nephritis, scattered tubercles.

Case No. 2356. Age, thirty-four. Male. White. Entered hospital 5-6-'04. Died 8-7-'04. Physician, Walsh. Clinical diagnosis, delirium tremens, tuberculosis of the lungs, enlarged liver, dilated right heart, tuberculosis of pleuræ, bronchial and mesenteric glands, small intestines, and appendix. Occupation, accountant nine months, in pool-room (manager) nine years, machinist eight years. Previous diseases, pneumonia, 1901. Duration of illness, three years. Weight, highest, one hundred and sixty-two pounds four years ago; on admission, one hundred and seventeen pounds; 6-14-'04, ninety-nine and one-half pounds. Bowels, irregular, inclined to be loose. Sputum, tubercle bacilli positive. Urine, 1026, acid, no albumin, no sugar, diazo positive. Heart, slightly accentuated aortic second, cannot outline heart dulness on account of pulmonary hyperresonance. Pulse, 86 to 130; respiration, 26 to 40; temperature, 98° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of right lung, edema of both lungs, pleurisy, caseous pneumonia of both lungs, emphysema, parenchymatous nephritis, tubercles in kidney, atheroma of aorta, cloudy swelling of liver, enlarged mesenteric glands. Heart, six and one-half ounces, shape, size, position, and color normal, muscle flabby, valves normal except one fenestration in one of the aortic leaflets. Ileum, jejunum, duodenum, marked congestion, no ulcers found; two ulcers in caput coli. Kidneys, left, seven ounces, swollen, present typical changes of large white kidney; two probable tubercles; right, seven ounces, slightly more congested than left.

Macroscopic study: Number of sections not recorded; numerous tubercles scattered throughout both kidneys.

Microscopic study: Twenty-eight specimens. Kidney investment normal. No fibrous areas. One or two areas of slight infiltration under investment, 0.12 mm. in diameter. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, sometimes congested, not vacuolated, one line space. Bowman's thickened, no infiltration about. Convoluted tubules (middle layer), the epithelium is swollen, degenerated, and necrotic. In the outer and inner layers the tubules are dilated, the epithelium atrophic and degenerated. Cortex not congested. Interstitial tissue not thickened. No infiltration between tubules. A rare hyaline cast. In the secretory tubules of medullary rays the epithelium is swollen, degenerated, and necrotic. Pyramids somewhat congested. Not stained for amyloid. Two or three typical tubercles with caseation and giant-cells in cortex. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2360. Age, thirty-three. Female. White. Entered hospital 5—9—'04. Died 6—15—'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, housework. Previous diseases, influenza, 1894; measles and pertussis in infancy. Duration of illness, one year. Weight, highest unknown; on admission, one hundred and eighteen pounds; 5—24—'04, seventy-seven pounds. No edema. Bowels, irregular. Sputum, tubercle bacilli present. Urine, high colored, acid, 1022, albumin, no sugar, calcium oxalate sodium urates. Heart, pulled up, apex in fourth interspace inside nipple-line, systolic murmur at pulmonary area. Pulse, 100 to 140; respiration, 34 to 48; temperature, 96° to 105°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, marked cavity formation in left lung, tuberculous pneumonia, pleurisy, fatty kidneys, tuberculous ulcers in intestines, fatty infiltration of liver, purulent peritonitis, slight dilatation of heart. Heart, six and one-half ounces, displaced to right and slightly upward, slightly enlarged, normal shape. Ileum contains numerous small ulcers in various stages—one 15 cm. from cecum has perforation; cecum contains numerous small ulcers. Kidneys, left, five and one-half ounces; right, five ounces, normal size, extremely pale, fatty.

Macroscopic study: Seventy sections; one positive tubercle, two apparent tubercles.

Microscopic study: Twenty-six specimens. Kidney investment not present. Fibrous areas not recorded. Malpighian bodies not recorded. Glomeruli swollen, cloudy, not vacuolated, not congested, no space. Bowman's thickened; no infiltration about. Convoluted tubules sometimes dilated, epithelium swollen, degenerated, and necrotic. Cortex not con-

gested. Some hyaline casts. In the secretory tubules of medullary rays the epithelium is swollen, cloudy, and frequently necrotic. Interstitial tissue thickened. Pyramids not congested. Two tubercles found, one typical, with caseation and giant-cells, both in cortex. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, tubercles.

Case No. 2416. Age, forty-six. Male. White. Entered hospital 5-23-'04. Died 7-5-'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis. Occupation, stable boss. Previous diseases, rheumatism, 1894; measles and pertussis. Duration of illness, three years. Weight, highest, one hundred and fifty-eight pounds; on admission, one hundred pounds; 5-31-'04, ninety-five and three-quarter pounds. Edema, swelling of feet for last two months, absent in the morning. Bowels, constipated until one month before death, than loose. Sputum, tubercle bacilli present. Urine, yellow, acid, 1020, no albumin, no sugar, diazo positive. Heart, normal. Pulse, 80 to 110; respiration, 20 to 30; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs with miliary tuberculosis, parenchymatous nephritis, tuberculous enteritis, beginning atheroma, enlarged mesenteric glands. Heart, nine ounces, enlarged, shape and position normal, muscle dark red, valves normal, epicardial fat gelatinous in appearance, aorta shows atheromatous change. Intestines, few small ulcers in ileum, several large irregular ulcerations in caput coli. Kidneys, small, dark, cortex streaked, cuts easily; several small areas which may be miliary tubercles; both kidneys have decided smell of urine.

Macroscopic study: One kidney cut into eighty sections; tubercles everywhere.

Microscopic study: Forty-six specimens. Kidney investment normal. Fibrous areas contain dilated tubules with atrophic epithelium. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli congested, not swollen, not cloudy, not vacuolated, several fibroid in fibrous areas; two lines space. Convoluted tubules generally dilated, especially in outer and inner layers; in middle layer swollen; epithelium atrophic, degenerated, disintegrated, and necrotic. Cortex congested. Interstitial tissue not thickened. Occasional hyaline and granular casts. Occasional local areas of round-cell infiltration. Pyramids congested. One small infarct. Many typical tubercles with caseation and giant-cells. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, tubercles.

Case No. 2444. Age, thirty-two. Female. White. Entered hospital 6—7—'04. Died 8—15—'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis, ischio-rectal abscess. Occupation, housework. Previous disease, measles in infancy. Duration of illness, eighteen months. Weight, highest, one hundred and thirty pounds; on admission, ninety-two pounds; 8—9—'04, eighty-one pounds. No edema. Bowels, regular. Sputum, tubercle bacilli present. Urine, amber, trace of albumin, no sugar, pus-cells, heavy sediment. Heart, no murmurs, no displacement, second pulmonic slightly accentuated. Pulse, 90 to 140; respiration, 28 to 44; temperature, 97° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy, old and recent upon both sides, ulcerative tuberculosis of both lungs, miliary tuberculosis with fibroid change in both lungs, fatty liver, enlarged spleen, enlarged mesenteric glands. Heart, ten ounces; shape, size, and position normal; muscle slightly flabby; slight thickening of mitral, right ventricle dilated. Intestines, normal, no ulcers found. Kidneys, left, six and one-half ounces, swollen, cuts easily, presents one or two small areas resembling tubercles, gives slight amyloid reaction; right, seven ounces, slightly swollen, presents two small tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections; many tubercles, kidney congested.

Microscopic study: Twenty specimens. No kidney investment. Fibrous areas not recorded. Infiltration under investment not recorded. Glomeruli swollen, cloudy, congested, not vacuolated. Bowman's normal, sometimes thickened. Convoluted tubules generally swollen, pink, cloudy, degenerated, sometimes disintegrated, necrotic. Cortex congested. Interstitial tissue thickened. Pyramids congested. Hyaline casts at edge of tubercles. Typical tubercles with caseation and giant-cells, one in pyramid and one in cortex. No amyloid to gentian-violet. Diagnosis, amyloid degeneration, tubercles.

Case No. 2446. Age, seventeen. Female. Black. Entered hospital 7—13—'04. Died 10—16—'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis. Occupation, general housework. Previous diseases, influenza, 1903; measles, 1896. Duration of illness, two years. Weight, highest, one hundred and ten pounds; on admission, eighty-three and one-fourth pounds. No edema. Bowels regular, diarrhea at times. Sputum, tubercle bacilli present. Urine, 10—3—'04, acid, 1030, trace of albumin, diazo positive, hyaline and granular casts. Heart, second pulmonic markedly accentuated. Pulse, 90 to 160; respiration, 23 to 90; temperature, 98° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, caseous pneumonia of left lung, pleurisy of both sides, fatty infiltration of liver, enlarged mesenteric glands, ulcers in appendix. Heart, six ounces, normal, muscle pale and firm. Intestines, apparently normal. Kidneys, left, four ounces; right, three and one-half ounces; small, presents signs of congestion.

Macroscopic study: One hundred and forty to one hundred and fifty sections; one suspicious tubercle.

Microscopic study: Fourteen specimens. Kidney investment normal. Typical fibrous areas. No infiltration under investment. Glomeruli congested, swollen, some vacuolated, a rare one fibroid, usually no space, sometimes one line space. Bowman's thickened. Convoluted tubules dilated, epithelium atrophic, degenerated, disintegrated, and necrotic. Secretory tubules of medullary rays same. Interstitial tissue not thickened. No hyaline casts. Pyramids congested. No tubercles. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 2468. Age, thirty-five. Female. White. Entered hospital 6—4—'04. Died 7—10—'04. Physician, Norris. Clinical diagnosis, pulmonary tuberculosis; femoral phlebitis. Occupation, housework. Previous diseases, not recorded. Duration of illness, six years. Weight, highest, one hundred and five pounds; on admission, eighty-nine pounds. Edema of left leg and foot. Bowels, constipated until two weeks before death, then loose. Sputum, tubercle bacilli numerous. Urine, 6—5—'04, negative; 6—20—'04, alkaline, 1026, no albumin, no sugar, diazo positive. Heart sounds weak, second pulmonic accentuated. Pulse, 90 to 130; respiration, 28 to 44; temperature, 97° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy, ulcerative tuberculosis of both lungs, tuberculous pneumonia of right lung, atrophy of heart, miliary tubercles in kidneys, cloudy swelling of kidneys, enlarged mesenteric glands, thrombosis of femoral vein, atrophy of ovaries. Heart, five ounces, much smaller than normal, position and shape normal, muscle darker, epicardial fat gelatinous in appearance, ventricles small, base of aorta atheromatous. Intestines, normal. Kidneys, left, three and one-half ounces, comparatively small, shows usual changes of parenchymatous nephritis; right, three and one-half ounces, same changes, small tubercles at periphery.

Macroscopic study: One hundred and forty to one hundred and fifty sections; two tubercles found.

Microscopic study: Sixteen specimens. Kidney investment normal.

One fibrous area with infiltration near tubercle; it seems to be connected with tubercle by a small streak. Glomeruli cloudy, swollen, congested, not vacuolated, one fibroid, sometimes one line space, sometimes no space. Bowman's thickened. Convoluted tubules generally dilated, especially about tubercle; epithelium sometimes atrophic, sometimes swollen, cloudy, degenerated, necrotic, disintegrated; the atrophic epithelium rarely necrotic; rather frequently white blood-corpuscles in tubules. Interstitial tissue slightly thickened. Cortex somewhat congested. Hyaline casts only in tubercle area. Pyramids somewhat congested. One tubercle with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis; tubercles.

Case No. 2477. Age, twenty-two. Female. White. Entered hospital 6-6-'04. Died 8-4-'04. Physician, Norris. Clinical diagnosis, tuberculosis of lungs and pleuræ. Occupation, laundry. Previous diseases, measles, pertussis, scarlet fever. Duration of illness, doubtful. Weight, highest, one hundred and fifteen pounds; on admission, eighty-three and one-quarter pounds; 7-19-'04, seventy-eight and one-quarter pounds. No edema. Bowels, regular, last week of life, loose. Sputum, tubercle bacilli present. Urine, not recorded. Heart, pulmonic second accentuated. Pulse, 96 to 180; respiration, 26 to 44; temperature, 98° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy with adhesions on right, ulcerative tuberculosis of both lungs with caseous pneumonia of right, tuberculous enteritis and appendicitis, fibroid ovaries, fatty liver (?), cloudy swelling of kidneys, enlarged mesenteric glands. Heart, seven ounces, smaller than normal, displaced to left, normal shape, muscle pale. Ileum contains several typical ulcers, also a typical ulcer in large intestine. Kidneys, not recorded.

Macroscopic study: One kidney cut into seventy-five sections; one positive tubercle, two probable ones.

Microscopic study: Sixty specimens. Kidney investment normal. Numerous typical fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli somewhat shriveled, not congested, vacuolated, occasionally fibroid (and then Bowman's thickened), two to three lines space, Bowman's not thickened, no infiltration about. Convoluted tubules dilated, epithelium atrophic, degenerated, and necrotic, necrosis extensive and wide-spread; occasional desquamation of epithelium, some exudation of lymphocytes into tubules. Occasional hyaline casts. Occasional epithelial casts or rather hyaline

material with epithelium attached. Interstitial tissue thickened, especially in areas, though these areas are numerous. Rare infiltration between tubules. Secretory tubules of medullary rays the same as convoluted tubules. Pyramids congested. One tubercle in cortex, one in pyramid, with caseation and giant-cells. One circumscribed area, 1 mm. of markedly thickened connective tissue (connective tissue being young and showing numerous nuclei) containing occasional hyaline glomeruli with thickening of Bowman's. One area of markedly thickened connective tissue in pyramid. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, scattered tubercles.

Case No. 2490. Age, fifty-two. Male. White. Entered hospital 7-12-'04. Died 7-21-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis, chronic pleuritis. Occupation, driver. Previous diseases, rheumatism, pleurisy, 1898, pneumonia, 3-'04, measles (?), pertussis (?), scarlet fever (?). Duration of illness, ten months. Weight, highest, one hundred and forty-nine and one-half pounds; on admission, one hundred and nineteen pounds. Edema, slight, of feet. Bowels, regular. Sputum, tubercle bacilli present. Urine, 7-14-'04, yellow, acid, 1018, no albumin, no sugar, diazo negative. Heart, right border runs into dulness of right chest, aortic and pulmonic second sounds both weak. Pulse, 90 to 130; respiration, 24 to 60; temperature, 97° to 102°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs (left practically entire, with a small cavity at apex, right with small cavity at apex), tuberculosis of pleuræ (obliterative of left), of bronchial glands, mesenteric glands, intestines (ulcers), appendix, kidneys; parenchymatous nephritis, fatty liver, tuberculosis of larynx. Heart, twelve ounces, larger than normal, both ventricles somewhat dilated, sclerosis (beginning) in aorta. Ileum contains five or six round ulcers with considerable infiltration about them, rest of intestines normal. Kidneys, left, six ounces, larger than normal, cortex pale, pyramids dark, cyst about size of marble on surface, with two or three small tubercles; right, six ounces, two very small cysts on surface.

Macroscopic study: One hundred and forty to one hundred and fifty sections; one tubercle in each kidney, about twelve small cysts, varying in size from pin-head to marble.

Microscopic study: Seventeen specimens. Kidney investment thickened. One typical fibrous area. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, slight or no congestion, not vacuolated, one hyaline fibroid in sphere

of large cyst, no space. Bowman's thickened. Convolted tubules near investment dilated, elsewhere normal, epithelium swollen, disintegrated, and degenerated, some necrosis. A few hyaline casts. Interstitial tissue thickened. No infiltration. Small cyst size of glomerulus immediately under capsule, looking like a dilated tubule filled with hyaline material; large cyst with compressed functionating tissue about it; this large cyst shows no capsule. In the secretory tubules of medullary rays the epithelium is swollen, degenerated, disintegrated, and necrotic. Pyramids congested. Typical tubercles with caseation and giant-cells. Not stained for amyloid. Diagnosis, chronic parenchymatous nephritis, scattered cysts, and tubercles.

Case No. 2494. Age, twenty-three. Male. White. Entered hospital 6—10—'04. Died 11—1—'04, Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs and intestines, surgical kidney (left). Occupation, hospital porter. Previous diseases, typhoid, 1—'04; rheumatism, 3—'04; measles, childhood; influenza, 1901. Duration of illness, three years. Weight, highest, one hundred and twenty-two and one-half pounds; on admission, one hundred and one-half pounds; 9—27—'04, one hundred and three-quarter pounds. Edema, slight swelling of feet. Bowels, loose. Sputum, tubercle bacilli present. Urine, amber, 1022, no sugar, trace of albumin, slight diazo. Heart, dulness increased, no murmurs. Pulse, 70 to 160; respiration, 20 to 43; temperature, 97° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative and miliary tuberculosis of both lungs, tuberculosis of intestines, appendix, left kidney, ureter, and bladder, cloudy swelling of right kidney, enlarged mesenteric and bronchial glands, small cyst at prepuce. Heart, five and one-half ounces; paler than normal. Ileum shows ulcers, rest of intestines normal. Kidneys, left, one pound with bladder, enlarged, bulging; the kidney structure is pale and represents only the margin of the organ; the remainder is taken up by large tuberculous process with abundant fibrous tissue; right, five ounces, pale, slightly larger than normal.

Macroscopic study: One kidney surgical, other kidney cut into seventy sections; several tubercles size of pea.

Microscopic study: Twenty specimens. Kidney investment not present. Fibrous areas not recorded. Infiltration under investment not recorded. Glomeruli vacuolated, swollen, not congested, no space. Bowman's thickened. Convolted tubules, epithelium swollen, cloudy, disintegrated. Occasional hyaline casts in cortex, many in pyramids. Cortex

congested. Interstitial tissue not thickened. Pyramids congested; one tubercle in pyramid. Typical tubercles with caseation and giant-cells and typical tubercle bacilli stained with carbol-fuchsin. Several tubules in the tubercles contain distinct pus-casts. No amyloid to gentian-violet. Diagnosis, right, cloudy swelling, scattered tubercles; left, surgical kidney.

Case No. 2538. Age, thirty-seven. Female. White. Entered hospital 6—22—'04. Died 9—24—'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis, tuberculosis of pharynx. Occupation previous to marriage, housework. Previous disease, typhoid, 1884. Duration of illness, fourteen months. Weight, highest, one hundred and sixty pounds; on admission, seventy-nine pounds; 9—6—'04, sixty-eight and one-half pounds. No edema. Bowels, regular until two weeks before death, then constipated. Sputum, tubercle bacilli positive. Urine, 6—22—'04, acid, 1025, no sugar, no albumin, diazo positive. Heart, normal. Pulse, 100; respiration, 40; temperature, 98° to 101°.

Autopsy, Walsh. Pathological diagnosis, emphysema and miliary tuberculosis of both lungs, ulcerative tuberculosis of both lungs, congestion of kidneys, fatty liver, cyst of fallopian tube, tuberculous ulceration of larynx. Heart, nine ounces, slightly enlarged, pale, and fatty. Intestines, normal. Kidneys, left, five ounces; right, five ounces; congested, negative to amyloid.

Macroscopic study: One hundred and forty-four sections.

Microscopic study: Eleven specimens. Kidney investment not present. Fibrous areas not recorded. Infiltration under investment not recorded. Glomeruli swollen, usually fill out Bowman's, several fibroid, somewhat congested, little or no space. Bowman's usually thickened. Convoluted tubules, epithelium swollen, cloudy, degenerated, and necrotic. Occasional hyaline casts in cortex. Cortex congested. In the secretory tubules of medullary rays the epithelium is swollen, cloudy, somewhat degenerated, necrotic. Interstitial tissue thickened. Cortex congested. Pyramids congested. No tubercles found microscopically or macroscopically. In specimen stained with carbol-fuchsin five tubercle bacilli were found in one lumen near investment. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, tubercle bacilli.

Case No. 2553. Age, forty-six. Male. White. Entered hospital 7—29—'04. Died 11—14—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of lungs with cavity formation on left, mitral sclerosis. Occupation, carpenter, twenty-two years (worked outside for twelve

years). Previous diseases, malaria, 1889 and 1903; influenza, 1889; rheumatism in left shoulder, measles, and pertussis in infancy. Duration, probably fifteen or twenty years. Weight, highest, one hundred and forty-nine pounds; on admission, one hundred and fifteen and one-half pounds; 11—8—'04, one hundred and eighteen pounds. Edema of feet after standing. Bowels, regular. Sputum, tubercle bacilli positive. Urine, acid, 1024, trace of albumin, no sugar, no diazo. Heart, rapid, presystolic mitral murmur. Pulse, 100 to 130; respiration, 25 to 35; temperature, 97° to 101°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative and miliary tuberculosis with emphysema of left lung, fibroid (or indurative) tuberculosis, miliary tuberculosis and emphysema of right lung, amyloid spleen, tubercles in kidney (right), congestion of both kidneys, tuberculosis of liver, enlarged bronchial and mesenteric glands, accessory spleen, pleurisy. Heart, larger than normal, right side dilated. Intestines, normal. Kidneys, left, six ounces; right, six ounces; slightly enlarged, dark red, pyramids purplish, cortex striated, one small pale, wedge-shaped area outlining a pyramid; no amyloid reaction.

Macroscopic study: One kidney cut into seventy sections; two tubercles (one twice and one four times size of millet-seed).

Microscopic study: Twenty-five specimens. Kidney investment normal, sometimes thickened. Several typical fibrous areas. Several areas of infiltration under investment. Glomeruli swollen, markedly congested, not vacuolated, fill out capsule, several fibroid. Bowman's thickened. Whole Malpighian body occasionally shriveled into one mass. Bowman's shows occasional proliferation of epithelium. Convoluted tubules, epithelium swollen, cloudy, degenerated, and necrotic. Secretory tubules of medullary rays same. Cortex markedly congested. Pyramids congested. Interstitial tissue not thickened. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2564. Age, thirty-six. Male. White. Entered hospital 7—1—'04. Died 8—6—'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs and larynx. Occupation, landscape gardener, two years; freight handler, six years; laborer. Previous disease, whooping-cough. Duration of illness, more than one year. Weight, highest, one hundred and forty pounds; on admission, ninety-three pounds; 7—12—'04, ninety-three pounds. Edema, marked in both feet. Bowels, constipated. Sputum, tubercle bacilli present. Urine, 1019, no albumin, no sugar, slight trace of

diazo. Heart, soft systolic murmur at pulmonic area. Pulse, 90 to 110; respiration, 30 to 40; temperature, 98° to 101°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy (adhesive), caseous pneumonia, ulcerative tuberculosis of both lungs, endocarditis of mitral valve, appendicitis, red atrophy of liver, renal tuberculosis, tubercles in adrenals, enlarged mesenteric glands. Heart, normal, slightly displaced to left. Intestines, hyperemic in areas, no ulcers. Kidneys, left, five ounces, normal size, cuts easily, pale on section, shows two or three small areas resembling tubercles, consistence firm; right, four ounces, size normal, presents scattered tubercles; on one surface shows an area 1 cm. in diameter, circular in outline, wedge shaped on section, yellowish in color.

Macroscopic study: One hundred and forty to one hundred and fifty sections; numerous tubercles with several small cysts.

Microscopic study: Six specimens. Kidney investment normal. Several fibrous areas short and broad, with tubules markedly dilated, epithelium markedly atrophic, an occasional hyaline cast, one fibroid glomerulus, no casts elsewhere. Other local areas of thickened connective tissue, 0.5 mm. in diameter. Possible healed tubercle. No infiltration under investment. Glomeruli swollen, cloudy, congested, not vacuolated, two fibroid. Bowman's thickened. Convoluted tubules somewhat dilated in inner and outer layers; the middle layer shows no lumen; epithelium degenerated, disintegrated, and necrotic in inner and outer layer, middle layer one mass of pink, swollen, cloudy, degenerated, necrotic tissue. In the secretory tubules of the medullary rays epithelium atrophic and sometimes necrotic. Cortex not congested. Interstitial tissue not thickened. Pyramids congested. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, tubercles.

Case No. 2576. Age, twenty-one. Male. White. Entered hospital 7-5-'04. Died 9-1-'04. Physician, Walsh. Clinical diagnosis, tuberculosis of both lungs with cavities, fistula in ano. Occupation, clerk, four years; school. Previous diseases, subject to colds every winter; fistula in ano 3-'04; typhoid, 1897. Duration of illness, seven years. Weight, highest, one hundred and forty pounds; on admission, seventy-four and three-quarter pounds; 8-9-'04, seventy-seven pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli positive. Urine, acid, 1030, no albumin, no sugar, diazo positive. Heart, one inch beyond right border of sternum, apex in fourth interspace and nipple-line, slight arteriosclerosis. Pulse, 100 to 130; respiration, 30 to 40; temperature, 98° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy, ulcerative and miliary tuberculosis of both lungs, congestion of kidneys, congestion of liver, enlarged mesenteric glands, tuberculosis of appendix. Heart, normal, displaced slightly downward. Intestines, apparently normal. Kidneys, left, four and one-half ounces; right, four ounces; small, firm, middle portion purplish in color, present no tubercles; both ureters show slight degree of hydronephrosis near pelvis.

Macroscopic study: Only one kidney cut, seventy sections. Left shows large discolored mass measuring one inch in diameter, extending down from surface through cortex and including one pyramid (only four pyramids in kidneys); the cortex has lost its glazed appearance and shows a mottled, granular, very light appearance. The right kidney shows a yellow streak extending down around one pyramid, but with healthy cortical tissue.

Microscopic study: Thirty-one specimens. Kidney investment normal. Fibrous areas not recorded. Infiltration under investment not recorded. Glomeruli swollen, cloudy, rarely vacuolated, sometimes congested, some fibroid. Bowman's thickened. Convoluted tubules, epithelium cloudy, swollen, disintegrated. Interstitial tissue not thickened. Cortex congested. No infiltration between tubules or about glomeruli. No casts. The two yellowish areas were infarcts. No amyloid to gentian-violet. Pyramids congested. No tubercles. Diagnosis, passive congestion; infarct.

Case No. 2582. Age, six. Male. Black. Entered hospital 7-6-'04. Died 8-17-'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis. Previous disease, measles, 2-'04. Duration of illness, five months. Weight, highest not recorded; on admission, thirty pounds; 7-15-'04, twenty-eight pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli present. Urine, 1030, yellow, granular casts, trace of albumin; casts did not give amyloid reaction. Heart, normal. Pulse 110 to 170; respiration, 30 to 90; temperature, 100° to 103°.

Autopsy, Walsh. Pathological diagnosis, miliary and caseous tuberculosis of both lungs with cavities, of both pleuræ (obliterative on left), of bronchial, tracheal, and mesenteric glands, of pericardium (slight), of peritoneum (extensive), of spleen, of kidneys. Heart, normal. Intestines, normal. Kidneys, left, two and one-half ounces; right, two and one-half ounces; normal in size, pale in color, one tubercle, no amyloid to Lugol's.

Macroscopic study: Number of sections not recorded.

Microscopic study: Twenty-eight specimens. Kidney investment normal. No fibrous areas. Several areas of infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen,

congested, not vacuolated; in middle layer glomeruli and Bowman's look to be one structure. Bowman's normal. Convoluted tubules in outer and inner layers are dilated, epithelium atrophic, degenerated, disintegrated, and sometimes necrotic. In the middle layer the epithelium is swollen, degenerated, disintegrated, and necrotic. No congestion. No casts. Interstitial tissue not thickened. No infiltration between tubules. Secretory tubules of medullary rays dilated, epithelium atrophic, degenerated, disintegrated, and sometimes necrotic. Pyramids not congested. Typical tubercle with caseation and giant-cells in pyramids. Mounted in celloidin and paraffin, stained with hematoxylin and eosin and van Gieson's. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2596. Age, forty-two. Male. White. Entered hospital 7-11-'04. Died 11-8-'04. Physician, McCarthy. Clinical diagnosis, tuberculosis, pulmonitis, neuritis. Occupation, weaver until 1892, since then driver and helper on brewery wagon. Previous diseases, typhoid, 1890; rheumatism, 1901; measles at nine; pertussis at twelve. Duration of illness, two years. Weight, highest, one hundred and eighty pounds; on admission, one hundred and twenty-eight and one-half pounds; 8-29-'04, one hundred and thirteen and one-quarter pounds. Edema, of feet, at night. Bowels, regular. Sputum, tubercle bacilli positive. Urine, 7-12-'04, 1010, no albumin, no sugar; 10-14-'04, diazo positive. Heart, accentuated second aortic. Pulse, 90 to 120; respiration, 25 to 35; temperature, 99° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, pleurisy on both sides, emphysema with miliary tubercles in left lung, ulcerative tuberculosis and caseous pneumonia of right lung, congestion of kidneys, congestion of liver, atheroma of tibial and femoral arteries. Heart, normal, slightly displaced to left. Ileum contains typical ulcers, rest of small and large intestine apparently normal. Kidneys, left, six ounces; shows some areas resembling miliary tubercles; right, five and one-half ounces; movable, large, somewhat congested.

Macroscopic study: One hundred and forty to one hundred and fifty sections; large, cortex thickened, pale, congested, six tubercles.

Microscopic study: Thirty-six sections. Kidney investment normal. Several typical fibrous areas. Glomeruli congested, one to three lines space in outer layer, no space in other two layers, one fibroid with infiltration about Bowman's. Bowman's not thickened. Convoluted tubules, epithelium swollen, degenerated, disintegrated, and necrotic. Some show white blood-cells within. Many hyaline casts. Interstitial tissue not thickened. In the

secretory tubules of medullary rays the epithelium is swollen and cloudy. Cortex not congested. Pyramids congested. Several tubercles with caseation and giant-cells, one in pyramids. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2602. Age, twenty-eight. Female. White. Entered hospital 7-12-'04. Died 11-1-'04. Physician, Norris. Clinical diagnosis, tuberculosis of the lungs. Occupation, housework. Previous diseases, measles, pertussis, scarlatina. Duration of illness, ten years. Weight, highest, one hundred and five pounds; on admission, eighty-three pounds; 9-6-'04, sixty-seven and three-quarter pounds. Edema, present. Bowels, constipated first month, rest of time loose. Sputum, tubercle bacilli numerous. Urine, 1020, acid, no albumin, no sugar. Heart, pulmonic second accentuated, hemic systolic murmur at base. Pulse, 100 to 140; respiration, 30 to 40; temperature, 99° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, emphysema, and bronchiectasis with miliary tuberculosis of right lung, amyloid spleen, tuberculous enteritis, parenchymatous nephritis, congestion of liver, atheroma of aorta. Heart, seven ounces, position normal, muscle slightly enlarged, left ventricular wall thickened, slight atheroma of aorta. Ileum contains ulcers, rest of intestines normal. Kidneys, small, pale, no evident tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections; two tubercles.

Microscopic study: Twenty-two specimens. Kidney investment thickened. Typical fibrous areas. Malpighian bodies normally distant from investment. Glomeruli swollen, not congested, not vacuolated, one line space, one fibroid glomerulus, one glomerulus with appearance of amyloid in center. Bowman's thickened, epithelium of Bowman's sometimes appears swollen and degenerated, again very much flattened out, one Bowman's shows marked proliferation of epithelium on one side. Convolute tubules near investment dilated, epithelium atrophic, elsewhere lumen small, epithelium swollen, degenerated, disintegrated, sometimes necrotic. Some congestion in cortex. In the secretory tubules of medullary rays the epithelium is degenerated and necrotic. Interstitial tissue not thickened. No tubercles. Pyramids congested. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 2657. Age, sixteen. Male. White. Entered hospital 8-5-'04. Died 9-20-'04. Physician, Stanton. Clinical diagnosis,

pulmonary tuberculosis, purpura hæmorrhagica. Occupation, gilding for three years, school previous. Previous disease, influenza, 2-'04. Duration of illness, one year. Weight, highest, one hundred and twenty pounds; on admission, eighty-seven pounds; 9-12-'04, eighty-one pounds. Edema two weeks before admission. Bowels, diarrhea, several small hemorrhages. Sputum, tubercle bacilli positive. Urine, acid, 1022, trace of albumin, diazo positive, no sugar. Heart, normal. Pulse, 100 to 150; respiration, 28 to 60; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative and miliary tuberculosis of both lungs, pleural adhesions, parenchymatous nephritis; fatty liver, tuberculous enteritis, enterorrhagia, accessory spleen, enlarged mesenteric glands, petechiæ on skin, pleuræ, and pericardium. Heart, six ounces, small, muscle pale and flabby, normal position and shape. Ileum contains a large quantity of fluid and clotted blood; the descending colon contains small quantity of blood, rest of intestines normal. Kidneys, left, four ounces; right, three and one-half ounces; small, pale, one miliary tubercle near pyramid.

Macroscopic study: Number of sections not recorded; several tubercles.

Microscopic study: Sixty specimens. Kidney investment normal. One or two fibrous areas. No infiltration under investment. Glomeruli sometimes swollen, sometimes congested, vacuolated, a few fibroid. One to two lines space. Bowman's usually normal, some slightly thickened. Convoluted tubules near investment dilated, epithelium atrophic, elsewhere epithelium sometimes swollen, cloudy, sometimes disintegrated, sometimes atrophic. Secretory tubules of medullary rays dilated, epithelium atrophic. One cellular cast found in cortex, several hyaline casts under investment. Pyramids not congested. No tubercles. No amyloid to gentian-violet. Diagnosis, cloudy swelling.

Case No. 2662. Age, forty. Female. White. Entered hospital 8-8-'04. Died 10-7-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis, carcinoma of common bile-duct. Occupation, with a circus for eight years; last twenty years, housework. Previous diseases, scarlet fever and diphtheria in childhood. Duration of illness, six months. Weight, highest, one hundred and sixty-five pounds; on admission, one hundred and four pounds; 9-13-'04, one hundred and three and one-half pounds. Edema, slight about ankles. Bowels, constipated until week before death, then loose. Sputum, tubercle bacilli numerous. Urine, acid, 1022, albumin trace, no sugar, no casts. Heart, normal. Pulse, 90 to 140; respiration, 24 to 44; temperature, 94° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of left lung, tuberculous pneumonia, edema of right lung with miliary tuberculosis of spleen and liver, probable cirrhosis of liver, fatty infiltration of heart, fatty kidneys with tubercles. Heart, nine ounces, small, muscle pale, soft, and shows streak of fat. Intestines, normal. Kidneys, left, seven ounces, enlarged, pale, flabby, shows large quantity of fat in pelvis; right, five ounces, smaller than left, presents several yellowish-white areas about 2 mm. in diameter, apparently tubercles.

Macroscopic study: One hundred and forty sections. Numerous tubercles.

Microscopic study: Twenty-seven specimens. Kidney investment normal. Many fibrous areas with fibroid glomeruli, infiltration, and hyaline casts. Malpighian bodies normally distant from investment. Glomeruli swollen, vacuolated, slightly congested, one line space. Bowman's thickened. Convoluted tubules dilated, epithelium atrophic, degenerated, disintegrated, and necrotic. Secretory tubules of medullary rays dilated, epithelium atrophic, degenerated, disintegrated, and necrotic. Local areas of marked increase of interstitial tissue. Occasional areas of congestion in cortex. Pyramids not congested. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Mounted in paraffin and celloidin and stained with hematoxylin and eosin and van Gieson's. Diagnosis, chronic parenchymatous nephritis, scattered tubercles.

Case No. 2664. Age, twenty-two. Male. White. Entered hospital 8—8—'04. Died 1—23—'05. Physician, Walsh. Clinical diagnosis, tuberculosis of both lungs. Occupation, bookbinder for thirteen years. Previous diseases, malaria at fifteen, pleurisy, pneumonia, pleuropneumonia, February, 1903 (sick nine weeks), and February, 1902; measles, pertussis, diphtheria in childhood, touch of typhoid-malaria, 1898. Duration of illness, six years. Weight, highest, one hundred and fifty-five pounds; on admission, one hundred and eleven and one-half pounds. Edema, of feet in morning on rising. Bowels, regular, recently streaked with blood. Sputum, tubercle bacilli positive. Urine, acid, 1016, no albumin, no sugar, no diazo. Heart, right border sternum, fifth interspace, one inch within nipple-line; presystolic mitral murmur. Pulse, 80 to 150; respiration, 18 to 40; temperature, 95° to 103°.

Autopsy, White. Pathological diagnosis, chronic tuberculosis of the lungs with bronchopneumonia, chronic fibroid pleurisy (both sides), toxic nephritis. Heart, slightly enlarged, muscle normal color, slightly dilated right and left ventricle. Intestines, congested, no irregular areas, no ulcera-

tions or tubercles. Kidneys, slightly enlarged, pale, cortex about normal, pyramids somewhat congested, capsule strips easily, right kidney a little longer than left.

Macroscopic study: One hundred and eighty sections.

Microscopic study: Thirteen specimens. Kidney investment normal or slightly thickened. Several typical fibrous areas. Several areas of infiltration, 0.25 mm. in diameter, looking like young tubercles; one area some distance from investment showing thickened interstitial tissue and hyaline casts. Glomeruli swollen, congested, not vacuolated, one line space. Bowman's thickened. Convoluted tubules, epithelium swollen, cloudy, no degeneration, slight necrosis. Secretory tubules of medullary rays the same. Slight congestion of cortex. Occasional hyaline casts in cortex, one epithelial cast. Interstitial tissue thickened. Pyramids congested. No tubercles. No amyloid to gentian-violet. Stained with carbol-fuchsin, but no tubercle bacilli found. Diagnosis, beginning interstitial nephritis.

Case No. 2668. Age, twenty-eight. Female. Black. Entered hospital 8-9-'04. Died 8-22-'04. Physicians, Norris and Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, house-servant, three years; child's nurse, two years; housework and washing, eight years. Previous disease, typhoid, 1881. Duration of illness, fifteen months. Weight, highest, one hundred and twenty-five pounds; on admission, not recorded. No edema. Bowels, regular. Sputum, not recorded. Urine, acid, 1020, no sugar, diazo positive, a trace of albumin. Heart, area of dulness normal, diffuse pulsation. Pulse, 90 to 170; respiration, 24 to 60; temperature, 97° to 104°.

Autopsy, Walsh. Pathological diagnosis, miliary tuberculosis of lungs, spleen, kidneys, liver, suprarenals, uterus (?), tuberculous ulceration of intestines, tuberculous peritonitis, tuberculosis of bronchial and mesenteric glands, parenchymatous nephritis, oöphoritis, endometritis. Heart, right ventricle quite dilated—about one and one-half normal size. Ileum contains numerous large ulcers; many are long or oblong, but the majority are round and about size of quarter; jejunum also contains ulcers. Kidneys, considerably larger than normal, pale in color, with cortex markedly thickened, riddled with miliary tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections.

Microscopic study: Twelve specimens. Kidney investment normal. No fibrous areas. No infiltration under investment, but several tubercles immediately under it. Malpighian bodies normally distant from investment. Glomeruli swollen, congested, not vacuolated, several hyaline fibroid, one-half

of one glomerulus destroyed and place filled with hyaline material, one to two lines space. Bowman's usually thickened. Convoluted tubules dilated, epithelium swollen, cloudy, disintegrated, necrotic. No congestion of cortex. Interstitial tissue normal or slightly thickened. Occasional hyaline casts in cortex outside of tubercles, some also in tubercles. Secretory tubules of medullary rays like convoluted tubules. Pyramids congested. Typical tubercles with caseation and giant-cells scattered everywhere, the majority in cortex, though some in pyramids. Diagnosis, acute parenchymatous nephritis, miliary tuberculosis.

Case No. 2689. Age, thirty-three. Male. White. Entered hospital 9-2-'04. Died 9-16-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis. Occupation, wood-worker. Previous diseases, typhoid (?), July, 1904; malaria, 1902; influenza, December, 1903. Duration of illness, two years. Weight, highest, one hundred and forty pounds; on admission, one hundred and sixteen pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli positive. Urine, 9-4-'04, acid, albumin present, diazo positive, no sugar, a few granular casts. Heart, apparently normal. Pulse, 120 to 140; respiration, 26 to 40; temperature, 98° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, right-sided pneumothorax, tuberculous pneumonia, ulcerative tuberculosis of right lung, edema and congestion of left lung, fatty liver, peritoneal adhesions, pleural adhesions, parenchymatous nephritis. Heart, ten ounces; slightly larger than normal, pushed to left. Intestines, normal. Kidneys, left, six ounces; right, six ounces; slightly irregular in shape, pale, normal in consistence, no tubercles present.

Macroscopic study: One hundred and forty sections; one slightly suspicious-looking tubercle.

Microscopic study: Sixteen specimens. Kidney investment normal. Several typical fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, not cloudy, sometimes slightly congested, vacuolated, occasionally fibroid, usually one to two lines space. Bowman's usually thickened. Convoluted tubules, epithelium swollen, cloudy, degenerated, and necrotic. Hyaline casts. Interstitial tissue somewhat thickened. Some congestion throughout cortex. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis.

Case No. 2701. Age, twenty-two. Male. Black. Entered hospital 9-12-'04. Died 10-9-'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs, larynx, and intestines. Occupation, waiter and huckster.

Previous disease, measles. Duration of illness, one year. Weight, highest, one hundred and forty-five pounds; on admission, one hundred and seventeen and one-half pounds; 9—20—'04, one hundred and sixteen pounds. No edema. Bowels, loose. Sputum, tubercle bacilli present. Urine, trace of albumin, otherwise negative. Heart, second pulmonic and aortic accentuated. Pulse, 80 to 140; respiration, 20 to 40; temperature, 96° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, tuberculous pneumonia of right lung, pleurisy, parenchymatous nephritis, mitral endocarditis, tuberculous appendicitis and peritonitis. Heart, small, mitral valves markedly thickened. Intestines, normal. Kidneys, slightly enlarged, pale, show slight pyramidal congestion; right more congested than left.

Macroscopic study: One hundred and forty to one hundred and fifty sections; congested, one possible tubercle.

Microscopic study: Forty-nine specimens. Kidney investment normal. Glomeruli swollen, cloudy, usually slightly congested, not vacuolated, usually fill out capsule, sometimes one line space, sometimes glomerulus and Bowman's appear one. Bowman's not thickened. Convoluted tubules, epithelium cloudy, swollen, some necrosis; many tubules, especially in congested areas, show desquamated epithelium, with here and there some infiltration of round-cells into the tubules. In the secretory tubules of medullary rays the epithelium is cloudy, swollen. No hyaline casts. No thickening of interstitial tissue. The possible tubercle was a large blood-vessel in the cortex filled with red blood-corpuscles. No tubercles. No amyloid to gentian-violet. Diagnosis, cloudy swelling.

Case No. 2716. Age, thirty-eight. Female. White. Entered hospital 9—7—'04. Died 11—30—'04. Physician, McCarthy. Clinical diagnosis, tuberculosis of lungs. Occupation, ran a steam press for fifteen years. Previous diseases, typhoid at thirteen, smallpox at three. Duration of illness, one year. Weight, highest, one hundred and forty-six pounds; on admission, ninety-two and one-half pounds; 11—22—'04, eighty-eight and one-half pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli present. Urine, acid, 1020, trace of albumin. Heart, aortic second accentuated. Pulse, 110 to 150; respiration, 25 to 48; temperature, 97° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, emphysema of left lung, empyema, fatty liver, parenchymatous nephritis, appendiceal ulcer, enlarged thyroid, enlarged mesenteric glands, enlarged bronchial glands. Heart, slightly flabby, aortic valve slightly atheromatous. Intestines, apparently normal. Kidneys, normal size and pale; right presents slight hydronephrosis.

Macroscopic study: One hundred and forty to one hundred and fifty sections; a few cysts, no tubercles.

Microscopic study: Twenty-eight specimens. Kidney investment normal. One typical fibrous area. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, congested, vacuolated, one line space. Bowman's thickened. Convoluted tubules, epithelium swollen, cloudy, degenerated, disintegrated, and somewhat necrotic. Hyaline casts. Secretory tubules of medullary rays the same. Interstitial tissue not thickened. Pyramids somewhat congested. No tubercles. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 2768. Age, thirty-three. Male. White. Entered hospital 10-3-'04. Died 11-23-'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of the lungs (partly miliary). Occupation, porter (furniture), seven years; iceman, ten years or more; school. Previous diseases, measles and pertussis. Duration of illness, two years. Weight, highest, one hundred and sixty-seven pounds; on admission, one hundred and seventeen and one-half pounds. No edema. Bowels, regular. Sputum, tubercle bacilli present. Urine, 1021, amber, no sugar, trace of albumin, diazo positive. Heart, pulmonic and aortic second accentuated. Pulse, 80 to 160; respiration, 24 to 42; temperature, 97° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, pneumothorax right side, effusion upon right side, caseous pneumonia of both lungs with ulcerative tuberculosis of right lung, edema and congestion of both lungs, fatty kidneys, displacement of liver, fatty infiltration of liver, pleurisy, enlarged bronchial glands, thrombosis of internal saphenous vein. Heart, eleven and one-half ounces, displaced slightly to left, apparently normal. Ileum congested, no ulcers, rest of intestines normal. Kidneys, left, six ounces; right, six ounces; normal in size, extremely pale, fatty, no tubercles evident.

Macroscopic study: One hundred and fifty sections; large white kidney, no tubercles.

Microscopic study: Ten specimens. Kidney investment normal. Several fibrous areas. Several areas of infiltration under investment. Glomeruli swollen, cloudy, some congested, not vacuolated, one line space. Bowman's thickened. Convoluted tubules, epithelium atrophic, disintegrated, and sometimes necrotic. Secretory tubules of medullary rays same. Interstitial tissue quite markedly thickened. Cortex congested. Many hyaline casts. Pyramids congested. One of the fibrous areas looks like a healed tubercle. No amyloid to gentian-violet. Diagnosis, interstitial nephritis.

Case No. 2787. Age, thirty-five. Female. White. Entered hospital 10-11-'04. Died 11-17-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, school until seventeen; dressmaker until twenty-three; housework, twelve years. Previous diseases, measles, pertussis. Duration of illness, two years. Weight, highest, one hundred and twenty-four pounds; on admission, not recorded. Edema, for past year about ankles. Bowels, regular. Sputum, tubercle bacilli positive. Urine, yellow, acid, no albumin, no sugar, diazo positive. Heart, second pulmonic accentuated. Pulse, 80 to 130; respiration, 20 to 52; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both apices, miliary tuberculosis of both lungs with emphysema, pleurisy, congested liver and kidneys, enlarged thyroid, enlarged mesenteric and bronchial glands, ulcers in caput coli. Heart, seven ounces, slightly enlarged, shows fatty infiltration; mitral valve slightly thickened. Ileum and caput coli contain a few ulcers, rest of intestines normal. Kidneys, left, four ounces; right, three ounces; congested, no visible tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections; apparently smaller than normal, slight congestion, a few suspicious tubercles.

Microscopic study: Twenty-eight specimens. Kidney investment normal. Typical fibrous areas. One area of infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen and fill out capsule, not vacuolated, slightly congested. Bowman's not thickened. Convoluted tubules near investment dilated, epithelium atrophic, degenerated, disintegrated, and necrotic; in the two inner layers the epithelium is swollen, degenerated. Rare infiltration of white cells into tubules, sometimes a few red cells in tubules. Hyaline casts. In the secretory tubules of medullary rays the epithelium is swollen, degenerated. Hyaline casts. Pyramids congested. What may have looked like a tubercle is an area, 1 mm. in from investment, with more or less hyaline degeneration. No tubercles. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 2796. Age, eighteen. Male. White. Entered hospital 10-13-'04. Died 11-25-'04. Physician, Hatfield. Clinical diagnosis, miliary tuberculosis of the lungs. Occupation, clerk, two years; errand boy, five months; school. Previous diseases, measles and scarlet fever in childhood. Duration of illness, one year. Weight, highest, one hundred and twenty-eight pounds; on admission, one hundred and six and one-quarter pounds; 11-8-'04, ninety-five and one-half pounds. Edema, at times in feet. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 1022, no albumin,

no sugar, diazo positive. Heart, pulmonic and aortic second markedly accentuated, very vigorous apex-beat. Pulse, 110 to 140; respiration, 20 to 44; temperature, 96° to 104°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, edema, congestion, caseous pneumonia of both lungs, pleurisy, valvulitis of aortic and mitral valve, fatty liver, fatty kidney with congestion, enlarged mesenteric and bronchial glands, tuberculous ulcers of ileum. Heart, eight ounces, apparently normal; each leaflet of mitral valve is thickly studded with small vegetations, and the aortic valve also shows a few vegetations; milk spots in the visceral pericardium. Ileum, Peyer's patches prominent, congested, contains a few ulcers, rest of intestines normal. Kidneys, left, four and one-half ounces; right, four and one-half ounces; small, pale, several areas of congestion.

Macroscopic study: One hundred and forty to one hundred and fifty sections; smaller than normal, cortex yellowish, general congestion, no tubercles.

Microscopic study: Eight specimens. Kidney investment normal. Several fibrous areas showing quite markedly thickened interstitial tissue and some hyaline casts in the tubules; no hyaline casts elsewhere. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, slightly congested, not vacuolated, one line space, one fibroid. Bowman's thickened. Convoluted tubules near investment dilated, epithelium swollen, degenerated, disintegrated, some necrosis. Secretory tubules of medullary rays same. Interstitial tissue not thickened. Cortex congested. Pyramids congested. No tubercles. No amyloid to gentian-violet. Diagnosis, cloudy swelling.

Case No. 2800. Age, forty-four. Male. White. Entered hospital 10-13-'04. Died 1-10-'05. Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs and pleuræ. Occupation, clerk, five months; foreman, six months; porter, six months; paper-hanger previously. Previous diseases, typhoid, 1879; measles and diphtheria, childhood; broke right patella, 1888; broke left patella, 1890. Duration of illness, fifteen years. Weight, highest, one hundred and fifty-eight pounds; on admission, one hundred and fourteen and three-quarter pounds; 12-27-'04, one hundred and three and one-quarter pounds. Edema, marked. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 1022, no sugar, no albumin, diazo positive. Heart, pulmonic second accentuated, aortic second markedly accentuated, slight systolic murmur at aortic cartilage. Pulse, 60 to 160; respiration, 18 to 46; temperature, 94° to 103°.

Autopsy, White. Pathological diagnosis, chronic tuberculosis of lungs, chronic obliterating pleurisy right side, chronic adhesive left side, atheromatous thickening of aortic valve, miliary tuberculosis of liver and kidneys, toxic nephritis, tuberculous ulceration of the intestines. Heart, muscle somewhat soft and yellowish in color, posterior leaflet of aortic valve contains a small calcified area at one side. Ileum contains ulcers, rest of intestines normal. Kidneys, capsule strips easily, a few small yellowish-white tubercles; section shows the cortex slightly swollen and paler than normal.

Macroscopic study: One hundred and forty to one hundred and fifty sections; enlarged, cortex diminished in size, many miliary tubercles in medulla and cortex.

Microscopic study: Eighteen specimens. Kidney investment normal. Fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Numerous hyaline casts near investment. In the fibrous areas a few fibroid glomeruli. Glomeruli usually congested, not swollen, not cloudy, not vacuolated, one line space. Bowman's slightly thickened. Convoluted tubules, epithelium atrophic, frequently degenerated and necrotic. In the secretory tubules of medullary rays the epithelium is atrophic, degenerated, necrotic. Cortex not congested. Interstitial tissue quite markedly thickened. Pyramids congested. Typical tubercles with caseation and giant-cells, especially in pyramids. No amyloid to gentian-violet. Diagnosis, interstitial nephritis, miliary tubercles.

Case No. 2815. Age, twenty-eight. Female. White. Entered hospital 10-18-'04. Died 11-9-'04. Physician, McCarthy. Clinical diagnosis, pulmonary tuberculosis. Occupation, housework. Previous diseases, malaria at twenty-four; pneumonia. Duration of illness, nine months. Weight, highest, one hundred pounds; on admission, not known. Edema, some swelling of both feet. Bowels, loose. Sputum, tubercle bacilli present. Urine, no analysis. Heart, normal, accentuated pulmonic and aortic second. Pulse, 120 to 150; respiration, 50 to 60; temperature, 99° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, coalesced tubercles in both lungs, caseous pneumonia and emphysema of right lung, pleurisy, red atrophy of liver, dilatation of right side of heart, displacement of uterus to right, enlarged mesenteric glands. Heart, enlarged, slight displacement to right, right side dilated and shows chicken-fat clot. Intestines, normal. Kidneys, movable, enlarged, dark red, and present slight striation of cortex.

Macroscopic study: One hundred and fifty sections.

Microscopic study: Thirteen specimens. Kidney investment normal.

No fibrous areas. Glomeruli swollen, cloudy, some vacuolated, some congested, rare fibroid glomerulus. Bowman's not thickened. Convoluted tubules, epithelium swollen, degenerated, and necrotic. Occasional round-cell infiltration between tubules, also between cells of convoluted tubules. In the secretory tubules of medullary rays the epithelium is necrotic. Rare hyaline casts. Interstitial tissue not thickened. No amyloid to gentian-violet. Pyramids not present. Typical tubercle with caseation and giant-cells in cortex. Diagnosis, acute parenchymatous nephritis, scattered tubercles.

Case No. 2821. Age, thirty-four. Male. White. Entered hospital 10-20-'04. Died 11-27-'04. Physician, McCarthy. Clinical diagnosis, tuberculosis of lungs. Occupation, waiter, twelve years. Previous disease, measles. Duration of illness, three months. Weight, highest, one hundred and seventy-five pounds; on admission, one hundred and thirty-six pounds; 11-14-'04, one hundred and thirty-six and three-quarter pounds. No edema. Bowels, regular. Sputum, tubercle bacilli present. Urine, 1024, no albumin, no sugar, diazo positive. Heart sounds distant and muffled, no murmurs. Pulse, 100 to 150; respiration, 30 to 40; temperature, 97° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of left lung with scattered miliary tubercles, emphysema and atelectasis of right lung, pleurisy with effusion, appendiceal ulcer, congestion of kidney, fatty (?) liver, enlarged bronchial glands. Heart, enlarged, dilated, especially on right side. Ileum congested, no ulcers, rest of intestines normal. Kidneys, enlarged, deeply congested, no tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections; large, cortex somewhat congested, hemorrhagic infarct at one pole, two tubercles found.

Microscopic study: Twenty-five specimens. Kidney investment normal or slightly thickened. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli usually somewhat congested, swollen, not vacuolated. Bowman's thickened. Convoluted tubules, epithelium degenerated, disintegrated, some necrosis. Secretory tubules of medullary rays the same. Interstitial tissue not thickened. Cortex congested. Pyramids congested. Four typical tubercles with caseation and giant-cells found in cortex. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, hemorrhagic infarct, scattered tubercles.

Case No. 2855. Age, twenty-nine. Male. White. Entered hospital

11—1—'04. Died 12—26—'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs, larynx, and pharynx. Occupation, plumber, fifteen years. Previous diseases, top of ear torn off, 1889; arm broken, 1890; measles in infancy; diphtheria, 1889. Duration of illness, two years. Weight, highest, one hundred and forty-four pounds; on admission, one hundred and thirteen and one-half pounds; 12—13—'04, one hundred and one-half pounds. No edema. Bowels, regular. Sputum, tubercle bacilli positive. Urine, dark, acid, 1026, no albumin, no sugar, diazo positive. Heart, aortic second accentuated, dullness one and one-half inches to right of sternum. Pulse, 110 to 130; respiration, 25 to 35; temperature, 98° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, chronic tuberculosis of the lungs with pneumothorax (right side), bilateral pleurisy, miliary tuberculosis of kidneys, chronic interstitial nephritis with toxic nephritis. Heart, dilated right side, slightly enlarged. Ileum is partly filled with yellowish fecal matter and gas; mucous membrane congested in areas, congestion particularly marked around the ileocecal valve; no ulceration or tubercles found. Kidneys, normal in size and shape, capsule slightly adherent, surface paler than normal, consistence firm; section shows cortex somewhat diminished in thickness and paler than normal, several pin-point to pin-head irregularly defined whitish areas (miliary tubercles) throughout.

Macroscopic study: One hundred to one hundred and fifty sections; four typical tubercles, two in cortex, two in medulla.

Microscopic study: Twenty-four specimens. Kidney investment normal. Six or seven fibrous areas showing considerable fibrous tissue, containing sometimes small atrophied tubules, sometimes dilated atrophied tubules. A few hyaline casts. Sometimes infiltration in these areas. Fibrous areas so numerous as to give appearance of interstitial nephritis; glomerular space sometimes filled with red blood-corpuscles; several tubules filled with red corpuscles. Malpighian bodies normally distant from investment. Glomeruli normal in size, not cloudy, congested, not vacuolated, some fibroid, two to three lines space. Bowman's thickened. Convoluted tubules generally somewhat dilated, epithelium, atrophic and necrotic. Secretory tubules of medullary rays dilated and filled with debris; epithelium degenerated, disintegrated, and necrotic. Cortex congested. Many hyaline casts. Interstitial tissue thickened. Pyramids congested. Typical tubercles with caseation and giant-cells, two in cortex, two in medulla. No amyloid to gentian-violet. Mounted in celloidin and paraffin, stained with hematoxylin and eosin, van Gieson's, and osmic acid. Diagnosis, chronic parenchymatous nephritis with considerable interstitial change, tubercles.

Case No. 2856. Age, forty-eight. Female. White. Entered hospital

11—2—'04. Died 11—30—'04. Physician, Ravenel. Clinical diagnosis, pulmonary tuberculosis. Occupation, housework. Previous diseases, pleurisy, rheumatism, pertussis, "cold," with pain in side, November, 1901. Duration of disease, three years. Weight, highest unknown; on admission, seventy pounds; 11—14—'04, seventy and one-half pounds. No edema. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 1012, negative as to sugar, albumin, and diazo. Heart shows very small area of dulness. Pulse, 90 to 120; respiration, 20 to 30; temperature, 94° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative tuberculosis of both lungs, tuberculous pneumonia of both lungs, emphysema and edema, tuberculosis of left adrenal, tuberculous peritonitis and enteritis, enlarged mesenteric and bronchial glands. Heart, six ounces, normal shape and position, muscle fairly normal, thickening and atheroma of the mitral and aortic leaflets. Ileum contains numerous typical ulcers, four of which have perforation, rest of intestines normal. Kidneys, small and apparently fibroid.

Macroscopic study: Number of sections not stated; numerous tubercles, one pea-sized cyst.

Microscopic study: Forty-six specimens. Kidney investment normal. Several fibrous areas composed principally of small round-cells. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, sometimes congested, not vacuolated, fill out capsule. Bowman's not thickened, though frequently it cannot be differentiated in the general swollen mass of the whole Malpighian body. Convoluted tubules, epithelium swollen, cloudy, necrotic. Occasional infiltration of small round-cells into tubules. In the secretory tubules of medullary rays the epithelium is degenerated and necrotic. Hyaline casts in cortex. Interstitial tissue not thickened. Cortex congested. Pyramids congested. Typical tubercles with caseation and giant-cells. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, tubercles.

Case No. 2899. Age, twenty-six. Male. White. Entered hospital 11—15—'04. Died 11—22—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of the lungs, acute tuberculous pneumonia. Occupation, morocco finisher. No previous diseases. Duration of illness, five years. Weight, highest, one hundred and seventy-five pounds; on admission, too ill to be weighed. Edema of feet. Bowels, regular. Sputum, extremely numerous tubercle bacilli. Urine, acid, 1024, no albumin, no sugar, no diazo. One hyaline cast, and a few pus-cells. Heart, normal. Pulse, 110 to 140; respiration, 24 to 48; temperature, 96° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, ulcerative and miliary tuberculosis of both lungs, gangrene of right lung, edema and emphysema of both lungs, miliary tuberculosis of liver, tubercles in kidney, appendicitis, enlarged mesenteric and bronchial glands, pleurisy, tuberculosis of right adrenal. Heart, displaced slightly toward left, muscle flabby. Several small ulcers in ileum, rest of intestines normal. Kidneys, about normal size, usual parenchymatous changes, miliary tubercles.

Macroscopic study: One kidney cut into seventy sections; quite a number of tubercles, some in pyramids and some in cortex.

Microscopic study: Thirty-eight specimens. Kidney investment normal. Several fibrous areas. Several hyaline casts in these areas, also small round-celled infiltration between and into tubules. Malpighian bodies normally distant from investment. Glomeruli swollen, congested, not vacuolated, no space. Bowman's thickened and shows some proliferation of the epithelium. Convolutd tubules, epithelium swollen, cloudy, degenerated, disintegrated, and necrotic. Secretory tubules of medullary rays same. Cortex congested. Interstitial tissue thickened. Pyramids congested. Six typical tubercles with caseation and giant-cells, four in cortex and two in medulla. In the area surrounding the tubercles there are sometimes hyaline casts. No amyloid to gentian-violet. Diagnosis, chronic parenchymatous nephritis, scattered tubercles.

Case No. 2926. Age, nineteen. Female. White. Entered hospital 11—26—'04. Died 12—22—'04. Physician, Ravenel. Clinical diagnosis, pulmonary tuberculosis. Occupation, housework. Previous diseases, malaria, 1903; measles in childhood. Duration of illness, three years. Weight, highest, one hundred and ten pounds; on admission, not recorded. No edema. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 1024, albumin positive, no sugar, diazo slight, pus-cells. Heart, reduplicated first sound. Pulse, 100 to 140; respiration, 28 to 52; temperature, 96° to 101°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs with cavity formation, of bronchial and mesenteric glands, of appendix, dilated right and left ventricle, parenchymatous nephritis. Heart, position and shape normal, larger than normal, dilatation of right ventricle, right ventricular wall thin, with cavity twice normal size, left ventricular wall thin and cavity one and one-half normal size. Intestines, normal. Kidneys, normal in size, pale, normal consistence, capsule reasonably adherent.

Macroscopic study: One hundred and forty to one hundred and fifty sections; one cyst one-half by one by one and one-quarter inches, filled with gelatinous caseated material, four tubercles.

Microscopic study: Twenty-six specimens. Kidney investment normal. Hemorrhagic infarct about 5 by 6 by 3 mm. under investment. In this area glomeruli are hyaline; epithelium of tubules destroyed; some tubules filled with red blood-corpuscles. Tissue for distance of 6 to 7 mm. participates in infarct. Many tubules filled with hyaline casts; many tubules packed with leucocytes; marked congestion; interstitial tissue thickened. No fibrous areas. Two areas of local infiltration under investment at some distance from infarct. The cyst is in the cortex, its origin indeterminate, some infiltration about it. Malpighian bodies normally distant from investment. Glomeruli swollen, congested, vacuolated, occasionally fibroid, no space. Bowman's thickened. Convoluted tubules, epithelium swollen, cloudy, degenerated, no necrosis. Secretory tubules of medullary rays same. Cortex not congested. Numerous hyaline casts. Interstitial tissue not thickened. Pyramids congested. No amyloid to gentian-violet. No tubercles. Diagnosis, acute parenchymatous nephritis, hemorrhagic infarct.

Case No. 2977. Age, twenty-eight. Female. White. Entered hospital 3-4-'05. Died 6-25-'05. Physician, Landis. Clinical diagnosis, tuberculosis of lungs, of axillary glands, of liver, and of intestines. Occupation, housework. Previous disease, scarlet fever. Duration of illness, over three weeks. Weight, highest, one hundred and thirty-five pounds; on admission, one hundred and twelve pounds. Edema, marked, of both feet. Bowels, constipated until one month before death, then continuous diarrhea. Sputum, tubercle bacilli positive. Urine, acid, 1026, no sugar, no albumin, diazo positive, casts; 6-10-'05, albumin present, diazo positive, hyaline, granular, and waxy casts. Heart, systolic murmur at pulmonic cartilage. Pulse, 90 to 140; respiration, 15 to 50; temperature, 95° to 102°.

Autopsy, White. Pathological diagnosis, tuberculosis of lungs with bilateral cavity formation, of pleuræ, amyloid spleen, and liver. Heart, contracted, shape about normal, aorta slightly atheromatous. Intestines, coils moderately distended with gas, dark-red, vessels prominent, contents chiefly semisolid and yellowish, no ulcers. Kidneys, capsule slightly adherent, surface slightly granular, consistence somewhat firm, section surface dull, opaque, red, thickness of cortex somewhat diminished; slight grade of diffuse nephritis with a few small isolated miliary tubercles.

Macroscopic study: Number of sections not recorded.

Microscopic study: Eleven specimens. Kidney investment normal. Typical fibrous areas with infiltration. Several Malpighian bodies a little nearer investment than normally. Glomeruli swollen, not cloudy, not vacuolated, not congested, rarely fibroid, usually no space, sometimes

one line space; a few loops show an amyloid appearance in fibrous areas. Bowman's slightly thickened. Convoluted tubules, no lumen, epithelium cloudy, swollen, degenerated, disintegrated, necrotic. Interstitial tissue normal or slightly thickened. Cortex not congested. Many hyaline casts. Pyramids somewhat congested. Several areas of typical infiltration in cortex, looking like young tubercles, but showing no caseation or giant-cells. Several localized areas 2 mm. in diameter, with markedly dilated tubules, atrophy of epithelium, thickening of interstitial tissue, and infiltration. One quite large area, 4 mm. in diameter, looking like healed tubercle in cortex; another one in pyramid. No typical tubercles. No amyloid to gentian-violet. Mounted in paraffin and stained with hematoxylin and eosin and van Gieson's. Diagnosis, acute parenchymatous nephritis.

Case No. 2989. Age, forty-seven. Male. White. Entered hospital 12-16-'04. Died 1-30-'05. Physician, Hatfield. Clinical diagnosis, tuberculosis of the lungs, moderate parenchymatous nephritis, caseous pneumonia. Occupation, painter, twenty-five years. Previous diseases, measles in childhood; syphilis, 1874; cold in kidneys, 1885; strained back, 1887; influenza, 1899; rheumatism, 1901; pleurisy, July, 1904; always subject to colds. Duration of illness, twenty years. Weight, highest, one hundred and fifty pounds; on admission, not recorded. No edema. Bowels, constipated. Sputum, tubercle bacilli present. Urine, yellow, acid, 1026, no sugar, trace of albumin, diazo positive, a few granular casts, epithelial cells, debris, etc., oil-globules. Heart, pulmonic and aortic second sound accentuated. Pulse, 100 to 150; respiration, 26 to 56; temperature, 95° to 102°.

Autopsy, White. Pathological diagnosis, chronic tuberculosis of lungs with cavity formation, chronic fibroid pleurisy, left side partial, chronic obliterative pleurisy, right side partial to fifth rib, miliary tuberculosis of spleen, liver, and kidneys, tuberculous adenitis of mesenteric glands, tuberculous appendicitis, enteritis. Heart, thirteen ounces, apparently dilated, normal in color and firm. Ileum contains several small pin-head, suspicious tubercles. Kidneys, left, seven and one-half ounces; right, eight ounces; capsule slightly adherent; surface shows a few small miliary tubercles, the largest about 2 mm. in diameter; surface is yellowish red throughout, and in cortex there are numerous pin-point, yellowish granules resembling calcification or sand particles, cortex thinned, capillaries slightly congested.

Macroscopic study: Number of sections not recorded; numerous doubtful tubercles, several yellowish miliary cysts.

Microscopic study: Twenty-four specimens. Kidney investment normal. Typical fibrous areas. Several areas of infiltration under investment. Mal-

pighian bodies normally distant from investment. Glomeruli normal, except somewhat cloudy, not congested, not vacuolated, one line space. Bowman's thickened. Convolutd tubules, epithelium swollen, degenerated, and necrotic; some infiltration about Malpighian bodies, also between convolutd tubules. Hyaline casts. Interstitial tissue thickened. Secretory tubules of medullary rays not found. Pyramids not congested. Typical tubercles with caseation and giant-cells in cortex. No amyloid to gentian-violet. Diagnosis, diffuse nephritis, scattered tubercles.

Case No. 3010. Age, thirty-seven. Male. White. Entered hospital 12-22-'04. Died 1-9-'05. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis, cirrhosis of liver, arteriosclerosis, hallucinations. Occupation, stevedore. Previous diseases, syphilis, 1884; diabetes. Duration of illness, one year. Weight, highest, two hundred and ten pounds; on admission, not recorded. Edema, four months ago on entrance to Pennsylvania Hospital. Bowels, regular. Sputum, tubercle bacilli positive. Urine, 12-23-'04, neutral, no sugar, 1020, trace of albumin, diazo positive, no casts. Heart, pulmonic and aortic second accentuated. Pulse, 74 to 150; respiration, 20 to 44; temperature, 98° to 103°.

Autopsy, White. Pathological diagnosis, chronic tuberculous arthritis (hip-joint), chronic and acute tuberculosis of the lungs, acute miliary tuberculosis of the kidneys, fatty cirrhosis and acute miliary tuberculosis of the liver, chronic obliterative pleurisy (double) and pericarditis, ischiorectal abscess and tuberculous ulceration of the rectum, chronic tuberculous adenitis of pelvic and abdominal lymphatic glands, chronic tuberculosis of the adrenals, tuberculosis of the bladder and prostate. Heart, slightly enlarged, shape normal, position normal. Intestines, normal. Kidneys, normal shape, but show a slight degree of lobulation, capsule strips easily, smooth, pale pink surface, section shows the cortex slightly thickened and pale, numerous pin-head tubercles.

Macroscopic study: One hundred and forty to one hundred and fifty sections; miliary tubercles.

Microscopic study: Twenty specimens. Kidney investment normal. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, congested, not cloudy, not vacuolated, sometimes one line space, sometimes none. Bowman's slightly thickened. Convolutd tubules, epithelium swollen, cloudy, degenerated, sometimes necrotic. Secretory tubules of medullary rays the same. Interstitial tissue not thickened. Cortex congested. The only hyaline casts found in cortex were one or two just outside a tubercle. Pyramids congested

and show many hyaline casts. Five typical tubercles with caseation and giant-cells, one in pyramid and four in cortex. Diagnosis, acute parenchymatous nephritis, miliary tuberculosis.

Case No. 3054. Age, twenty-eight. Male. White. Entered hospital 1-9-'04. Died 2-2-'05. Physician, Walsh. Clinical diagnosis, tuberculosis of lungs. Occupation, clerk in office thirteen years. Previous diseases, mumps, measles, and membranous croup as infant; malaria, 1896-97; pleurisy, 1900, on left. Duration of illness, seventeen years. Weight, highest, one hundred and fifty pounds; on admission, one hundred and twenty-three and one-quarter pounds; 1-30-'05, one hundred and twenty pounds. No edema. Bowels, regular. Sputum, tubercle bacilli positive. Urine, acid, 1020, trace of albumin, no sugar, diazo positive. Heart, slight accentuation of pulmonic and aortic second sounds. Pulse, 80 to 120; respiration, 20 to 40; temperature, 95° to 102°.

Autopsy, White. Pathological diagnosis, chronic tuberculosis of the lungs, chronic fibroid pleurisy (obliterating), acute miliary tuberculosis of the kidneys, spleen, and liver; tuberculous enteritis, toxic nephritis, fatty liver. Heart, dilated right side; position and shape normal. Intestines, congested and contain ulcers. Kidneys, normal shape, capsule strips easily, pale pink, consistence firm, surface smooth, pale pink cortex; surface and surface section show a few miliary tubercles.

Macroscopic study: One hundred and fifty sections; numerous tubercles.

Microscopic study: Thirty specimens. Kidney investment normal. No fibrous areas. Several areas of infiltration under investment. Two or three Malpighian bodies pretty close to investment. Glomeruli swollen, cloudy, congested, slightly vacuolated, one line space. Bowman's capsule thickened, especially in areas near young and old tubercles. Convoluted tubules, epithelium swollen, cloudy, degenerated, disintegrated, necrotic. Secretory tubules of medullary rays, epithelium the same. Interstitial tissue not thickened. Some infiltration between tubules. Cortex congested. Pyramids congested. Many miliary tubercles, especially in cortex, showing caseation and giant-cells. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis, miliary tubercles.

Case No. 3388. Age, thirty-six. Male. White. Entered hospital 5-29-'05. Died 6-4-'05. Physician, Stanton. Clinical diagnosis, tuberculosis, right pneumothorax. Occupation, carpenter. Previous diseases, influenza, February, 1905; measles, mumps, chicken-pox. Duration of illness, over four months. Weight, highest, not recorded; on admission, not recorded. No edema. Bowels, constipated. Sputum, 5-20-'05, nega-

tive. Urine, not recorded. Heart, normal. Pulse, 100 to 160; respiration, 25 to 60; temperature, 97° to 100°.

Autopsy, White. Pathological diagnosis, tuberculosis of both lungs with cavity formation on right, of pleuræ; diffuse nephritis. Heart, contracted, pushed to left, normal shape. Intestines distended with gas, no ulcers; some coils show moderate amount of congestion. Kidneys, small, capsule slightly adherent, surface smooth, color reddish brown; consistence firm, section surface dull, opaque, dark reddish brown; slight diffuse nephritis, and a few scattered tubercles.

Macroscopic study: Number of sections not recorded.

Microscopic study: Twelve specimens. Kidney investment normal. Typical fibrous areas, sometimes with infiltration. Malpighian bodies normally distant from investment. Glomeruli congested, swollen, not vacuolated, one line space, many fibroid in fibrous areas. Bowman's slightly thickened. Convoluted tubules, no lumen, epithelium swollen, cloudy, degenerated, disintegrated, some necrosis. Secretory tubules of medullary rays the same. Some infiltration between tubules, especially near investment. Interstitial tissue slightly thickened. Some congestion in cortex. Many hyaline casts. Blood-vessels thickened. Pyramids somewhat congested. No tubercles found. Mounted in paraffin, stained with hematoxylin and eosin, and van Giesen's. Diagnosis, chronic parenchymatous nephritis.

Private case. Age, thirty-one. Female. White. Started treatment 6—23—'01. Died 8—24—'04. Physician, Flick. Occupation, school-teacher. Duration of illness, twelve years. Weight, highest, one hundred and fifty pounds; 6—23—'01, one hundred and thirteen pounds. Edema of the legs. Bowels, constipation and diarrhea alternating. Sputum, tubercle bacilli positive. Urine, no record of examination, but recollection is that an examination was made but found negative.

Autopsy, Walsh. Pathological diagnosis, bilateral chronic adhesive pleurisy, healed tuberculosis of the right lung, partially healed tuberculosis of the left lung with cavity formation, emphysema and edema of both lungs, tuberculosis of the bronchial glands, acute diffuse nephritis, a few scattered tubercles in the kidneys. Heart, completely covered by emphysematous lungs, normal in size, color, and consistence, subepicardial adipose tissue marked. Intestines normal. Kidneys, enlarged one and one-half to twice normal size, normal shape, capsule slightly adherent, consistence softer than normal; surface of section cloudy, dull; cortex markedly thickened, pale in color; pyramids normal in size, but congested; several small, yellowish, millet-seed to split-pea-sized areas on external surface and surface of section.

Macroscopic study: One hundred and forty sections.

Microscopic study: Forty specimens. Kidney investment normal. Malpighian bodies normally distant from investment. Glomeruli enlarged. Hyaline degeneration apparent in the epithelial cells of the loops. Quite marked thickening of the connective tissue of Bowman's capsule. Widespread marked necrosis of the epithelium of the convoluted tubules and the secretory tubules of medullary rays. Numerous hyaline casts. Thickening of interstitial tissue between the tubules. Infiltration of small round-cells between tubules and sometimes about glomeruli. Several areas of destroyed tubules replaced by infiltration of small round-cells which look like young tubercles. Blood-vessel walls thickened. Several typical tubercles with caseation and giant-cells. No amyloid to gentian-violet. Diagnosis, acute diffuse nephritis, scattered tubercles.

Case No. 142. Age, forty-seven. Male. Black. Entered hospital 2-19-'04. Died 2-22-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis. Occupation, waiter. Previous diseases, pneumonia, pleurisy (doubtful), rheumatism, measles, pertussis, diphtheria, influenza. Duration of illness, five years. Weight, highest, one hundred and eighty-eight pounds; on admission, one hundred and thirty-nine and one-half pounds. Edema of feet four weeks ago. Bowels, regular. Sputum, not recorded. Urine, not recorded. Heart, apex in fifth interspace, systolic retraction of apical region, very irregular, no murmurs. Pulse, 100 to 140; respiration, 32 to 48; temperature, 95° to 100°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of the lungs and fibrosis of pleuræ, serous effusion of pleuræ, tuberculosis of bronchial and mesenteric glands, dilatation of heart, both right and left ventricles, sclerosis of aortic valve and aorta. Heart, position and shape normal, enlarged, dilated right ventricle quite marked, muscle thinned, dilated left ventricle not marked, aortic valve sclerotic and contracted. Intestines, no ulcers. Kidneys, somewhat larger than normal, cortex thickened, pale, pyramids congested. No special macroscopic study.

Microscopic study: Seven specimens. Kidney investment normal. One fibrous area with infiltration, in which is one fibroid glomerulus. Malpighian bodies normally distant from investment. Glomeruli not swollen, vacuolated, not congested; one line space, sometimes three to five lines space filled with debris. Bowman's not thickened. Convoluted tubules, dilated, epithelium atrophic, degenerated, disintegrated, somewhat necrotic. Cortex not congested. Rare hyaline casts. Interstitial tissue thickened. Secretory tubules of medullary rays dilated, the epithelium atrophic, degenerated, but not

necrotic. Pyramids not congested. No amyloid to gentian-violet. Stained by van Giesen's and confirmed. Diagnosis, chronic parenchymatous nephritis.

Case No. 172. Age, forty-nine. Male. White. Entered hospital 1-10-'04. Died 2-4-'04. Physician, Norris. Clinical diagnosis, pulmonary tuberculosis with cavity formation, old tuberculosis of testicle. Occupation, stone polisher. Previous disease, typhoid. Duration of illness, five years. Weight, highest, one hundred and fifty pounds; on admission, not recorded. Edema, considerable of left foot and leg, some of right foot. Bowels, loose. Sputum, tubercle bacilli present. Urine, passes involuntarily through fistula. Heart, reduplicated systolic mitral and accentuated pulmonic second. Pulse, 64 to 116; respiration, 16 to 30; temperature, 95° to 102°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of both lungs, of kidneys, obliteration of left pleura, amyloid kidney and liver. Heart, eight and one-half ounces, normal in size and color. Intestines, normal to external examination. Kidneys, left, eight ounces; large, pyramids congested, cortex very pale; right, six and one-half ounces, same as left. No special macroscopic study.

Microscopic study: Twenty-eight specimens. Kidney investment normal. Many typical fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli normal in size and almost every one shows amyloid to gentian-violet; usually one line space. Bowman's thickened. Convoluted tubules everywhere almost cystic dilated, with atrophy, degeneration, and rarely necrosis of epithelium. Secretory tubules of medullary rays the same. Marked increase of interstitial tissue everywhere. Many hyaline casts. Many red blood-casts. Pyramids not congested. Amyloid also in blood-vessels. Mounted in paraffin and celloidin and stained with hematoxylin and eosin and van Giesen's; also gentian-violet. Diagnosis, amyloid degeneration, no tubercles.

Case No. 313. Age, thirty-seven. Male. White. Entered hospital 2-20-'04. Died 2-25-'04. Physician, Walsh. Clinical diagnosis, pulmonary tuberculosis with cavities on both sides, obliterative pleurisy. Occupation, butcher. Previous disease, pleurisy. Duration of illness, two years. Weight, highest, one hundred and ninety-two pounds; on admission, one hundred and thirty-seven pounds. No edema. Bowels, constipated. Sputum, no examination made. Urine, no examination made. Heart, normal. Pulse, 116 to 126; respiration, 36 to 44; temperature, 98° to 100.2°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of the lungs,

pleuræ, mesenteric glands, and appendix, parenchymatous nephritis. Heart, normal. Intestines, normal. Kidneys, left, about normal; if anything, enlarged; pale, pyramids congested, two small (pea-sized) cysts present at junction of cortex and pyramids; right markedly congested. No special macroscopic study.

Microscopic study: Fifty-one specimens. Kidney investment normal. Several fibrous areas not beginning at investment but lower down, possibly in other sections reach investment. Several areas of infiltration under investment—two of these are evident tubercles, others look like them and are, therefore, probable tubercles. In areas of infiltration and tubercles occasional hyaline casts. Malpighian bodies normally distant from investment. Glomeruli not swollen, not cloudy, not congested, vacuolated, rarely fibroid; two lines space. Bowman's thickened. Interstitial tissue slightly thickened. Cortex not congested. Convoluting tubules dilated, the epithelium atrophic, degenerated, and necrotic. In the secretory tubules of medullary rays the epithelium atrophic, sometimes swollen, but not necrotic. In several places decided fibrous change, apparently small scars. Many hyaline casts. Typical tubercles with caseation and giant-cells. No amyloid to gentian-violet. Pyramids not congested. Diagnosis, chronic parenchymatous nephritis, tubercles.

Case No. 414. Age, thirty-seven. Male. White. Entered hospital 4—10—'03. Died 6—7—'03. Physician, Brinton. Clinical diagnosis, pulmonary tuberculosis, tuberculous laryngitis, and enteritis. Occupation, varnish-maker. Previous disease, typhoid, 1893. Duration of illness, over four years. Weight, highest, one hundred and eighty-five pounds; on admission, one hundred and thirty-nine pounds. No edema. Bowels, very loose throughout treatment. Sputum, tubercle bacilli positive. Urine, 5—17—'03, acid, 1016, no albumin, no sugar, no diazo, granular and fatty epithelial cells. Heart, normal. Pulse, 90 to 144; respiration, 24 to 36; temperature, 95° to 103°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of the lungs, of pleura, and of larynx. Heart, normal size, mitral valve normal, aortic slightly sclerotic, muscle paler and more flabby than normal; in aorta a few sclerotic patches. Intestines, not recorded. Kidneys, larger and softer than normal, cortex paler than normal and much reduced in size, no special macroscopic study.

Microscopic study: Twenty-five specimens. Kidney investment normal. One fibrous area, 0.5 mm. broad and 1 mm. long near investment. No infiltration under investment or elsewhere. Malpighian bodies normally dis-

tant from investment. Glomeruli swollen, not cloudy, not congested, one to two lines space. Bowman's distinctly thickened everywhere. Convoluted tubules usually dilated, epithelium atrophic, frequently degenerated and necrotic; in certain nests almost the whole epithelium is necrotic. Numerous hyaline casts. In the secretory tubules of medullary rays the epithelium is atrophic, sometimes degenerated and necrotic; these tubules also contain hyaline casts. Interstitial tissue thickened. Pyramids not congested. Diagnosis, parenchymatous nephritis.

Case No. 1157. Age, thirty-four. Female. White. Entered hospital 7-29-'03. Died 6-3-'04. Physician, Stanton. Clinical diagnosis, pulmonary and laryngeal tuberculosis. Occupation, service. No previous diseases. Duration of illness, six months. Weight, highest, one hundred and twenty-five pounds; on admission, ninety-four pounds. No edema. Bowels, diarrhea until two months before death, when they became regular. Sputum, tubercle bacilli positive. Urine, 7-29-'03, acid, 1010, no albumin, no sugar, leucocytes. Heart, normal. Pulse, 80 to 90, respiration, 20 to 30; temperature, 98° to 100°.

Autopsy, Rosenberger. Pathological diagnosis, miliary tuberculosis of lungs with cavities in both, emphysema, congestion; infarct in kidney, catarrhal appendicitis, red atrophy of liver, extreme emaciation. Heart, nine and one-half ounces; right ventricle shows fatty infiltration; the ventricular wall is thin (about 3 mm.), muscle flabby. Intestines, normal. Kidneys, recent congestion, pale, an old infarct in left kidney. No special macroscopic study.

Microscopic study: Ten specimens. Kidney investment normal. Malpighian bodies normally distant from investment. Glomeruli slightly swollen, markedly vacuolated, not congested, two lines space. Bowman's not thickened, sometimes slight proliferation of Bowman's. Convoluted tubules, epithelium granular, disintegrated, little necrosis. Secretory tubules of medullary rays the same. Interstitial tissue slightly thickened. Cortex not congested. Pyramids not congested. Typical tubercles in cortex with caseation and giant-cells; several isolated tubercle bacilli found with carbol-fuchsin. Diagnosis, chronic parenchymatous nephritis, tubercles.

Case No. 1344. Age, twenty-one. Female. White. Entered hospital 2-1-'04. Died 5-10-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, laundry, paper-box factory. Previous diseases, measles, pertussis. Duration of illness, one year. Weight, highest, one hundred and ten pounds; on admission, seventy-nine pounds. No edema.

Bowels, regular. Sputum, tubercle bacilli present. Urine, 2—2—'04, acid, 1020, no albumin, no sugar, no diazo; 3—20—'04, acid, 1022, no albumin, no sugar, diazo positive. Heart, apex visible in fourth interspace inside of midclavicular line, slight thrill, no murmurs. Pulse, 100 to 140; respiration, 24 to 30; temperature, 98° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, chronic ulcerative tuberculosis of both lungs with cavity involving the whole of each upper lobe; tuberculous appendicitis, enteritis, fatty kidneys, congestion of liver. Heart, normal or slightly smaller. Ileum contains a few small ulcers, mucous membrane markedly hyperemic; rest of intestines normal. Kidneys, small and pale, apparently fatty. No special macroscopic study.

Microscopic study: Sixty-two specimens. Kidney investment thickened. Several short fibrous areas. Several areas of infiltration under investment resembling young tubercles. Malpighian bodies a little closer to investment than normally. Glomeruli not cloudy, not congested, not vacuolated, not swollen, one fibroid, two lines space. Bowman's thickened. Convoluted tubules epithelium swollen, cloudy, some degeneration, slight necrosis. Secretory tubules of medullary rays the same. Cortex not congested. Interstitial tissue slightly thickened. Occasional hemorrhage into tubules. Pyramids not congested. One small cyst. A suspicious-looking tubercle without giant-cells and caseation in addition to infiltration under investment. Localized areas of thickening of connective tissue. Diagnosis, mild parenchymatous nephritis, possible tubercles.

Case No. 1402. Age, thirty-two. Male. White. Entered hospital 2—1—'04. Died 2—4—'04. Physician, Walsh. Clinical diagnosis, tuberculosis of the lungs, chronic parenchymatous nephritis. Occupation, miner. Previous disease, not recorded. Duration of illness, four years. Weight, highest, one hundred and seventy pounds; on admission, one hundred and forty-two and three-quarter pounds. Edema, considerable in ankles. Bowels, irregular, occasionally diarrhea. Sputum, tubercle bacilli positive. Urine, 2—3—'04, albumin, dark granular and hyaline casts, few leucocytes. Heart, pulmonic second accentuated, otherwise negative. Pulse, 80 to 130; respiration, 16 to 32; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, hypertrophy of heart, chronic valvular endocarditis, healed tuberculosis of lungs, amyloid kidney. Heart, seventeen and one-half ounces, normal shape, twice normal size. Intestines, no ulcers. Kidneys, left, ten ounces; right, eight and three-quarter ounces, larger than normal, pale. No special macroscopic study.

Microscopic study: Ninety-four specimens. Kidney investment normal.

One area of infiltration, 0.5 mm. wide, extending 2 mm. into cortex. In this area of infiltration several glomeruli have undergone complete degeneration. Malpighian bodies not infrequently closer than normal to investment. Glomeruli normal in size, contain considerable hyaline material, show amyloid to gentian-violet. Bowman's thickened, frequent infiltration of round-cells about Bowman's. Convoluted tubules in outer layer usually somewhat dilated, epithelium more or less atrophic, lumen frequently filled with debris, no necrosis. In inner layer epithelium swollen, degenerated, and sometimes necrotic. Hyaline casts. One tubule filled with leucocytes. Secretory tubules of medullary rays same as inner layer of convoluted tubules. Here and there collections of round-cells looking like young tubercles. Cortex not congested. Interstitial tissue somewhat thickened. Pyramids not congested. Many hyaline casts. No tubercles. Diagnosis, amyloid degeneration.

Case No. 1433. Age, twenty-six. Male. White. Entered hospital 2-18-'04. Died 2-20-'04. No history.

Autopsy, Walsh. Pathological diagnosis, acute miliary tuberculosis of the lungs, chronic tuberculosis of lungs, parenchymatous nephritis. Heart, normal. Intestines, normal. Kidneys, enlarged, cortex swollen, pale, pyramids congested. No special macroscopic study.

Microscopic study: Seven specimens. Kidney investment thickened. One short fibrous area with fibroid glomeruli. There are localized areas of thickening in other parts of the cortex. No infiltration under investment. Malpighian bodies a little closer to investment than normally. Glomeruli normal in size, not cloudy, not congested, vacuolated, several under investment fibroid. Bowman's usually not thickened. Convoluted tubules slightly dilated, the epithelium degenerated, disintegrated, but not necrotic. In the secretory tubules of medullary rays the epithelium is the same. Cortex not congested. Interstitial tissue slightly thickened. Pyramids slightly congested. Stained with van Gieson's and confirmed. Diagnosis, mild interstitial nephritis.

Case No. 1490. Age, thirty-eight. Male. White. Entered hospital 9-24-'03. Died 2-9-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis and emphysema. Occupation, salesman. Previous diseases, appendicitis, measles, influenza. Duration of illness, five years. Weight, highest, one hundred and eighty-two pounds; on admission, one hundred and twenty-two pounds. No edema. Bowels, regular. Sputum, tubercle bacilli positive. Urine, 1018, acid, clear. Heart, normal. Pulse, 90 to 130; respiration, 20 to 40; temperature, 96° to 102.2°.

Autopsy, Rosenberger. Pathological diagnosis, tuberculosis of lungs, larynx, pleuræ, and kidneys. Heart, normal. Intestines, six small ulcers in ileum. Kidneys, normal size and consistence, quite pale. No special macroscopic study.

Microscopic study: Twenty-seven specimens. Kidney investment normal. Several typical fibrous areas. No infiltration under investment. Malpighian bodies a little closer to investment than normally. Glomeruli swollen, vacuolated, not congested, rarely fibroid, one to two lines space. Bowman's thickened. Convoluted tubules, some dilated, some swollen (about half and half); the epithelium is swollen, cloudy, degenerated, disintegrated, and necrotic. In the secretory tubules of the medullary rays the epithelium is cloudy, degenerated, and disintegrated. Interstitial tissue slightly thickened. Cortex not congested. Rare hyaline casts. Pyramids not congested. Typical tubercles with caseation and giant-cells in cortex. Specimens mounted in celloidin and paraffin, stained by hematoxylin and eosin and van Giesen's. Diagnosis, parenchymatous nephritis, tubercles.

Case No. 1621. Age, forty-one. Male. White. Entered hospital 10—21—'03. Died 12—19—'03. Physician, . Clinical diagnosis, pulmonary tuberculosis. Occupation, cigar-maker. Previous diseases, typhoid, 1869; pleurisy, 1881; pneumonia, 1902; measles, pertussis, influenza. Duration of illness, ten years. Weight, highest, one hundred and forty-two pounds; on admission, one hundred and two and one-half pounds. No edema. Bowels, regular until last month, then loose. Sputum, tubercle bacilli present. Urine, acid, 1017, no sugar, no albumin, no diazo. Heart, both aortic and pulmonic second sounds markedly accentuated. Pulse, 110 to 160; respiration, 22 to 40; temperature, 96° to 104°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of the lungs with cavities, obliterative pleurisy. Heart, seven and three-quarter ounces, on anterior surface two milk spots otherwise normal. Intestines, normal. Kidneys, large, pale, cortex thicker than normal. There was no special macroscopic study made.

Microscopic study: Six specimens. Kidney investment normal. Several typical fibrous areas 1.5 mm. in diameter. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, not cloudy, congested, not vacuolated, completely fill out capsule, occasional one fibroid. Convoluted tubules dilated, epithelium somewhat atrophic and degenerated, some necrosis. Some interstitial congestion in cortex. The convoluted tubules near pyramids show no lumen; the epithelium is swollen and cloudy. Interstitial tissue normal. In the secretory tubules of medul-

ary rays the epithelium is swollen, degenerated, and sometimes necrotic. Pyramids not congested. Diagnosis, toxic nephritis.

Case No. 1756. Age, seventeen. Male. White. Entered hospital 2-1-'04. Died 2-8-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis. Occupation, nickel-plater. Previous diseases, measles, pleurisy, December, 1903. Duration of illness, not recorded. Weight, highest, one hundred and thirteen pounds; on admission, ninety-one and one-half pounds. No edema. Bowels, constipated. Sputum, tubercle bacilli positive. Urine, not recorded. Heart, dulness slightly enlarged toward left, second aortic much accentuated. Pulse, 100 to 136; respiration, 28 to 56; temperature, 97° to 103°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of the lungs, of the pleuræ, of the left kidney, of mesenteric glands; dilatation of right and left ventricle. Heart, seven and one-half ounces; ventricles slightly larger than normal, walls thickened. Intestines, normal. Kidneys, left, five ounces; right, five and one-half ounces; about normal size, pale. No special macroscopic study.

Microscopic study: Twenty-one specimens. Kidney investment normal. No fibrous areas. Two areas of infiltration under investment, about $\frac{1}{2}$ mm. in diameter. Hyaline casts here and there in areas of infiltration, not elsewhere. Malpighian bodies normally distant from investment. Glomeruli swollen, not cloudy, not congested, not vacuolated, usually fill out capsule, sometimes one line space. Bowman's normal. Convoluted tubules generally dilated in all three layers, epithelium sometimes cloudy, swollen, sometimes atrophic, degenerated, disintegrated, and sometimes necrotic. Secretory tubules of medullary rays same. Cortex not congested. No thickening of interstitial tissue. Some areas of infiltration looking like young tubercles scattered throughout cortex. Pyramids not present. No amyloid to gentian-violet. Diagnosis, acute parenchymatous nephritis.

Case No. 1988. Age, sixteen. Male. White. Entered hospital 2-1-'04. Died 2-15-'04. Physicians, Walsh, Hatfield, and Brinton. Clinical diagnosis, tuberculosis of lungs, larynx (?), intestines (?). Occupation, school. No previous diseases. Duration of illness, two months. Weight, highest, one hundred and twenty pounds; on admission, sixty-eight and one-half pounds. No edema. Bowels, constipated. Sputum, not examined. Urine, not examined. Heart sounds weak. Pulse, 96 to 130; respiration, 26 to 38; temperature, 98° to 103°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis of lungs, obliterative pleurisy, tuberculosis of intestines and appendix, of bronchial and mes-

enteric glands, diffuse nephritis. Heart, normal. Ileum shows three or four small ulcers, rest of intestines normal. Kidneys, left, four and one-quarter ounces; right, three and three-quarter ounces; normal in size, somewhat congested. No special macroscopic study.

Microscopic study: Thirty specimens. Kidney investment normal. No fibrous areas. No infiltration under investment. Malpighian bodies a little closer than normally. Glomeruli swollen, vacuolated, slightly congested, one to two lines space. Bowman's normal. Convoluted tubules generally dilated, the epithelium swollen, degenerated, and sometimes necrotic. In the secretory tubules of the medullary rays the epithelium is pretty healthy. Cortex not congested. No thickening of interstitial tissue. Pyramids not congested. No amyloid to gentian-violet. Diagnosis, cloudy swelling.

Case No. 1998. Age, twenty-nine. Male. White. Entered hospital 2-12-'04. Died 3-21-'04. Physician, Norris. Clinical diagnosis, tuberculosis of lungs with cavities, tuberculosis of small intestines and appendix. Occupation, not recorded. Previous diseases, malaria, pleurisy. Duration of illness, one year. Weight, highest, one hundred and sixteen pounds; on admission, ninety pounds. No edema. Bowels, loose. Sputum, tubercle bacilli positive. Urine, 2-11-'04, negative, 1030; 3-10-'04, acid, 1029, trace of albumin, no sugar, diazo positive, abundance of granular casts. Heart, apparently normal. Pulse, 100 to 120; respiration, 32 to 40; temperature, 98° to 101°.

Autopsy, Rosenberger. Pathological diagnosis, tuberculosis of both lungs, of both kidneys and appendix, of mesenteric and bronchial glands, fatty degeneration of kidneys. Heart, normal. Intestines, normal. Kidneys left, quite pale, otherwise normal; right, quite pale, two small cysts on surface and one or two miliary tubercles in pyramids. No special macroscopic study.

Microscopic study: Forty-seven specimens. Kidney investment normal or slightly thickened. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli not swollen, not cloudy, not vacuolated, not congested, rarely fibroid; two lines space. Bowman's normal or very slightly thickened. Convoluted tubules show no lumen, the epithelium swollen, degenerated, disintegrated, somewhat necrotic. Rare hyaline casts. Interstitial tissue thickened. In the secretory tubules of medullary rays the epithelium is swollen, but not necrotic. Cortex slightly congested. Pyramids congested. The cyst studied was in cortex and showed nothing peculiar. Stained with carbol-fuchsin and Gabbet's, but no tubercle bacilli found. Diagnosis, mild chronic parenchymatous nephritis.

Case No. 2104. Age, thirty-two. Male. White. Entered hospital 2-15-'04. Died 2-16-'04. Physician, Stanton. No history.

Autopsy, Rosenberger. Pathological diagnosis, acute gelatinous pneumonia (tuberculous) of right upper lobe with extensive infiltration of both lungs, hypertrophy with fatty infiltration of heart, obliterative pleurisy on left, fatty liver. Heart, normal position and shape, left ventricle somewhat enlarged, wall somewhat thinned. Intestines, normal. Kidneys enlarged, pale, not decided, however. No special macroscopic study.

Microscopic study: Two (paraffin) specimens. Kidney investment normal. Several fibrous areas. Malpighian bodies closer to investment than normally. Connective tissue under investment thickened. Glomeruli vacuolated, not congested, not cloudy, not swollen, under investment usually contracted. Bowman's thickened. Convoluted tubules dilated, the epithelium atrophic and somewhat necrotic. Cortex not congested. Interstitial tissue thickened. Pyramids not congested. Stained also with van Giesen's and confirmed. Diagnosis, mild interstitial nephritis.

Case No. 2138. Age, twenty-five. Female. White. Entered hospital 2-28-'04. Died 3-11-'04. Physician, Landis. Clinical diagnosis, pulmonary tuberculosis. Occupation, stenographer. Previous diseases, typhoid, malaria, influenza. Duration of illness, one and one-half years. Weight, highest, one hundred and thirty-one pounds; on admission, one hundred and nine pounds. No edema. Bowels, loose, Sputum, tubercle bacilli present. Urine, diazo positive, no albumin, no sugar. Heart, not recorded. Pulse, 80 to 140; respiration, 20 to 38; temperature, 98° to 104°.

Autopsy, Walsh. Pathological diagnosis, tuberculosis (part acute miliary, part chronic) of both lungs, of pleuræ, of kidneys, of appendix, ileum, mesenteric and bronchial glands; parenchymatous nephritis. Heart, normal. Ileum contains six to nine ulcers. Kidneys, large, very pale, cysts small, here and there throughout pyramids. Small cyst in cortex. No special macroscopic study.

Microscopic study: Twenty-seven specimens. Kidney investment not present. Fibrous areas not recorded. Infiltration under investment not recorded. Glomeruli vacuolated, not swollen, not cloudy, not congested; two lines space. Bowman's slightly thickened. Convoluted tubules dilated, the epithelium somewhat atrophic, degenerated, disintegrated, and necrotic. Interstitial tissue thickened. The one cyst studied appeared to be a dilatation of Bowman's capsule. Cortex not congested. Pyramids not congested. No amyloid to gentian-violet. Diagnosis, parenchymatous nephritis.

Case No. 2181. Age, twenty-two. Male. White. Entered hospital

3-12-'04. Died 5-3-'04. Physician, McCarthy. Clinical diagnosis, pulmonary, laryngeal, and intestinal tuberculosis, cirrhotic fatty liver, appendicitis. Occupation, mould-maker for glass. Previous diseases, pneumonia and influenza. Duration of illness, three years. Weight, highest, one hundred and fifty pounds; on admission, one hundred and four and one-half pounds. No edema. Sputum, tubercle bacilli present. Urine, 3-13-'04, albumin pus-cells and casts present, no tubercle bacilli. Bowels, generally loose. Heart, negative. Pulse, 110 to 130; respiration, 28; temperature, 99° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, tuberculosis of the lungs with cavity formation, especially at apices, tuberculous pneumonia, pericardial effusion, enlarged mesenteric glands. Heart, normal. Intestines, normal. Kidneys, left, six ounces; right, five ounces; show fatty change. No special macroscopic study.

Microscopic study: Thirty-six specimens. Kidney investment normal. No fibrous areas or infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli swollen, cloudy, not congested, not vacuolated; one line space. Bowman's thickened. Convoluted tubules, epithelium degenerated, swollen, disintegrated, frequently necrotic; rare tubules contain leucocytes. Interstitial tissue not thickened. Cortex not congested. No hyaline casts. Medullary rays not seen. Pyramids congested. One area of dense fibrous tissue in pyramid, 1 mm. in diameter, a cross-section looking like a healed tubercle; this shows tubules scattered throughout it. Stained with carbol-fuchsin, and several tubercle bacilli found. Diagnosis, acute parenchymatous nephritis.

Case No. 2238. Age, twenty-five. Male. White. Entered hospital 4-29-'04. Died 5-15-'04. Physician, Stanton. Clinical diagnosis, pulmonary tuberculosis with pneumothorax; pneumothorax developed suddenly. Occupation, waiter. Previous diseases, measles, pertussis. Duration of illness, six years. Weight, highest, one hundred and forty-eight pounds; on admission, one hundred and nine pounds. No edema. Bowels, loose. Sputum, tubercle bacilli present. Urine, 5-12-'04, no albumin, sugar present, diazo present, excess of phosphates. Heart, normal, second pulmonic sound slightly loud. Pulse, 100 to 120; respiration, 28; temperature, 98° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, pneumothorax right side, chronic ulcerative tuberculosis of both lungs with wide-spread cavity formation, tuberculous pneumonia, adhesive pleurisy, fatty infiltration of liver, small miliary tubercles in appendix. Heart, seven ounces, normal. In-

testines, normal. Kidneys, left, five and one-half ounces; right, six ounces, pale, and in some areas congested. No special macroscopic study.

Microscopic study: Thirty-six specimens. Kidney investment thickened. No fibrous areas. No infiltration under investment. Malpighian bodies normally distant from investment. Glomeruli vacuolated, not congested, not swollen, some fibroid, one to two lines space. Bowman's thickened. Convoluted tubules, sometimes dilated, sometimes lumen diminished; in both cases the epithelium is degenerated, disintegrated, and frequently necrotic; some nests of tubules dilated and filled with blood. In the secretory tubules of medullary rays the epithelium is swollen, cloudy, degenerated, disintegrated, and necrotic. Cortex not congested. Interstitial tissue thickened. Pyramids not congested. No amyloid to gentian-violet. Stained with carbol-fuchsin, but no tubercle bacilli found. Mounted in celloidin and paraffin; stained with hematoxylin and eosin and van Gieson's. Diagnosis, chronic parenchymatous nephritis.

Case No. 2311. Age, twenty-four. Male. White. Entered hospital 4-23-'04. Died 5-1-'04. Physician, Hatfield. Clinical diagnosis, tuberculosis of lungs, tuberculous peritonitis and laryngitis (?). Occupation, glass-worker. Previous diseases, pleurisy, pneumonia, influenza, measles, pertussis. Duration of illness, three months. Weight, highest, one hundred and sixty-two pounds; on admission, one hundred and thirty-eight pounds. No edema. Bowels, diarrhea. Sputum, tubercle bacilli present. Urine, 4-24-'04, acid, 1021, amber, trace of albumin, no sugar, debris, phosphates, a few hyaline and granular casts. Heart, area of dulness normal; second aortic sound is sharp and metallic. Pulse, 110 to 160; respiration, 22 to 54; temperature, 95° to 103°.

Autopsy, Rosenberger. Pathological diagnosis, pulmonary tuberculosis of both lungs, tuberculous pneumonia of right lung with cavity formation, emphysema of both lower lobes, tuberculous ulcers in intestines and appendix, enlarged mesenteric glands. Heart, ten ounces, normal shape and size, muscle pale, though firm. Intestines, ulcers throughout ileum, two showing perforation, caput coli ulcerated. Kidneys, not recorded. No special macroscopic study.

Microscopic study: Six specimens. Kidney investment normal. No fibrous areas. No infiltration under investment. Malpighian bodies closer to investment than normally. Glomeruli swollen, cloudy, not vacuolated, not congested; one to two lines space. Bowman's thickened. In the convoluted tubules the lumen is normal, the epithelium is swollen, cloudy, but not necrotic, not degenerated, not disintegrated. Occasional hyaline casts. Cor-

tex not congested. Secretory tubules of medullary rays not recorded. Interstitial tissue not thickened. Pyramids not congested. Diagnosis, cloudy swelling.

Case No. 2324. Age, forty-five. Male. White. Entered hospital 4—29—'04. Died 5—27—'04. Physician, Irwin. Clinical diagnosis, pulmonary tuberculosis. Occupation, cabinet-maker. No history of previous disease. Duration of illness, probably fifteen years. Weight, highest, one hundred and thirty pounds; on admission, eighty-five and one-half pounds. No edema. Bowels, very loose. Sputum, tubercle bacilli positive. Urine, 4—30—'05, acid, 1022, no albumin, no sugar. Heart, presystolic mitral murmur, some arteriosclerosis. Pulse, 110 to 120; respiration, 30 to 40; temperature, 96° to 102°.

Autopsy, Rosenberger. Pathological diagnosis, tuberculosis of both lungs, fragile adhesions of both pleuræ, tuberculosis of appendix with ulceration, fatty degeneration of both kidneys, chronic hyperemia of liver (nutmeg). Heart, normal; muscle, pale, slightly flabby; valves normal except for fenestration, linear in shape, of aortic leaflet. Intestines, no ulcerations. Kidneys, normal in size, very pale, cortex somewhat thicker than normal. No special macroscopic study.

Microscopic study: Twenty-six specimens. Kidney investment thickened. No fibrous areas. No infiltration under investment or elsewhere. Three or four Malpighian bodies touching investment. Glomeruli swollen, not vacuolated, not congested, not cloudy, a few fibroid; one to two lines space. Bowman's thickened. In the convoluted tubules the epithelium is swollen, cloudy, degenerated, disintegrated, and sometimes necrotic. One tubule cystic dilated, filled with hyaline material, and containing fifteen or sixteen round-cells. Cortex not congested. Five or six small cysts in cortex. Interstitial tissue not thickened. One localized area of markedly thickened interstitial tissue about 1 mm. in diameter and about 1 mm. from investment; in this the tubules are normal and contain no hyaline casts. Occasional nests of convoluted tubules dilated, epithelium flattened, but otherwise healthy. The epithelium of the secretory tubules of medullary rays is somewhat cloudy, occasionally disintegrated, but not necrotic. Pyramids not present. Diagnosis, acute parenchymatous nephritis.

Conclusions in regard to the kidneys in cases of tuberculosis of the lungs:

Pathological: (1) Positive tubercles were found in the kidneys in 58 % of cases.

(2) Every form of nephritis was found except glomerulonephritis. The most common form was parenchymatous.

(3) The other most common abnormalities found were fibrous and cellular areas under the investment, which possibly represent healing or healed tubercles.

(4) The macroscopic appearance of the kidneys frequently failed to correspond with the microscopic diagnosis.

Clinical: (1) Inoculation experiments showed tubercle bacilli in the urine in 82.5 % of the urines inoculated.

(2) Edema was not the rule, though it was frequent.

(3) Albumin was not the rule; it appears to be uncommon to the heat and nitric-acid or the potassium ferrocyanid and acetic-acid test, though a trace was found in this series frequently with the heat and acetic-acid test.

(4) Casts and pus-cells apparently depend on the carefulness of the observer, varying in my studies from 13 % to 40 %.

(5) The heart was commonly normal both clinically and pathologically; when abnormal, no relation was found between the heart and the kidney condition.

(6) The nephritis accompanying tuberculosis may be surmised but cannot be assured; with the possible exception of amyloid, the kind of nephritis cannot be even surmised.

(7) The most common clinical symptoms of nephritis in tuberculosis, according to my personal studies, are hyaline and granular casts and tubercle bacilli in the urine. Less frequent symptoms are pain or ache in the lumbar region, albumin in the urine, edema, and looseness of the bowels, which may or may not alternate with constipation. Still other symptoms appear to be unusual fatigue upon slight exertion, unaccountable dyspnea, and rapid pulse.

JOSEPH WALSH.

LITERATURE.

1. Flick and Walsh, "Proceedings of the Pathological Society of Philadelphia," vol. 5, November, 1901.
2. Heyn, "Virchow's Archiv," vol. 165, 1901, p. 42.
3. Coffin, "Thèse de Paris," 1890.
4. Landouzy and Bernard, "La Presse Medicale," No. 22, March, 1901.
5. Guihal (E.), "Gaz. des hôp.," 1902, Nos. 7-10.
6. Leredde, "Archives de Med. Exp.," vol. 7, 1895.
7. D'Arrigo, "Centralbl. für Bakt.," vol. 28, September, 1900, p. 225.
8. Grancher and Martin, "Revue de la Tuberculose," 1893.
9. Carriere, "Archives de Med. Exp.," vol. 9, 1897.

REPORT ON THE CARDIAC CONDITIONS IN TUBERCULOUS CASES

ENCOUNTERED AT THE PHIPPS INSTITUTE DURING THE FIRST
TWO YEARS OF ITS EXISTENCE, BASED ON A STUDY OF
TWENTY-THREE HUNDRED AND FORTY-FOUR CASES, AND
OF ONE HUNDRED AND FORTY-THREE AUTOPSIES.

The condition of the heart in pulmonary tuberculosis has been the subject of investigation and contention off and on ever since Louis made the statement that tuberculosis nearly always occurred in individuals with small hearts, and since the subsequently enunciated doctrine of Rokitansky that tuberculosis and valvular disease of the heart never occurred coincidentally. The last-named author believed that congestion and stagnation of the blood in the lungs were unfavorable to the development of tuberculous disease. This view still finds supporters who argue that the following factors are productive of a relative immunity: Congestion of the lungs when long standing produces an increased dilatation and tortuosity of the pulmonary capillaries, causing them to project into the alveoli, which in turn brings about an increased transudation of serum. Later cell-proliferation, with slight hypertrophy of the fibrous and muscular tissue, takes place, this being accompanied by an increased deposition of pigment. Here we have several causes at work which might inhibit the growth of the tubercle bacillus. First, the increased transudation of serum tends to wash out foreign bodies from the bronchioles, also favors cell-nutrition, and exercises a germicidal effect. Second, fibrous hyperplasia is in itself more or less inhibitive and destructive to tuberculous processes. Third, the addition of muscular tissue permits the more forcible expulsion of extraneous

material. Fourth, attention has lately been called by Pearce to the hypertrophy of the elastic fibers which occurs in the pulmonary tissues when chronic congestion exists, a state of affairs which would be in accord with the contention of Hess that the resistance of the lungs to tubercle bacilli is in large measure dependent upon the amount of elastic tissue they possess.

The following pathological conditions were encountered in one hundred and forty-three autopsies:

PERICARDIUM.

Normal,.....	86
Adhesions,.....	3
Milk spots,.....	28
Complete obliteration,.....	8
Acute serous pericarditis,.....	1
Gelatinous degeneration of epicardial fat,.....	15
Miliary tubercles,.....	3

HEART.

Muscle normal in appearance,.....	109
Muscle pale and flabby,.....	28
Heart small—atrophy,.....	13
Bifid apex,.....	2
Muscle showed fatty change,.....	6
Hypertrophy of right heart,.....	4
Dilatation of right heart,.....	19
Hypertrophy and dilatation of right heart,.....	7
Hypertrophy of left heart,.....	9
Dilatation of left heart,.....	1
Hypertrophy and dilatation of left heart,.....	6
Endocarditis:	
Mitral sclerosis,.....	6
Mitral vegetations (old),.....	3
Mitral vegetations (recent),.....	2
Aortic sclerosis,.....	10
Aortic vegetations (old),.....	1
Aortic vegetations (recent),.....	1
Aortic fenestration,.....	8
Aortic insufficiency and obstruction,.....	1
Heart displaced—	
(a) To right,.....	4
(b) To left,.....	6

BLOOD-VESSELS.

Atheroma of aorta,.....	29
Calcareous changes in coronaries,.....	1

It will be noted that evidences of pericardial inflammation were encountered fifteen times in one hundred and forty-three autopsies (10.4 %); this, of course, includes both acute and chronic varieties, but is not astonishing when we consider the frequency with which the neighboring structures (from which the majority of cases of tuberculous pericarditis arise) are the seat of disease—*i. e.*, pleuræ, lungs, bronchial lymph-nodes. Of course, it is not certain that all these cases of pericarditis were specifically tuberculous in origin, as actual tubercles could be found in only three; but it is probable that the vast majority of pleural adhesions found at autopsy result from tuberculous disease, even though we cannot demonstrate specific lesions, yet we do not question their etiology. Furthermore, it is entirely in accordance with our belief that the great majority of slowly progressing insidious inflammations of serous membranes result from tuberculosis; and it is also well known that dull pains and aches in the precordial region are of very frequent occurrence in the course of the disease. During the past year I was able to collect data concerning the pericardium in one thousand seven hundred and eighty tuberculous autopsies, and found that after all cases of doubtful etiology were excluded, pericarditis—almost certainly tuberculous—occurred in 4.6 %.¹

Milk spots, which occurred in 20 % of the cases, are known to be a very common post-mortem finding. It was formerly supposed that these lesions arose as the result of localized inflammation, ruptured adhesions, etc., but the view has lately been advanced by Herxheimer, who has made an especial study of the subject, that their origin is a solely mechanical one, inasmuch as microscopically there is destruction of the endothelial cells but no round-cell infiltration. One case tabulated under the head of "Acute Serous Pericarditis" showed petechial subendothelial hemorrhages. The term gelatinous degeneration is purely descriptive, being used to designate those very common cases in

¹ "Tuberculous Pericarditis," Geo. W. Norris, "University of Pa. Med. Bulletin," July, 1904.

which the pericardial fat has the appearance of soft jelly, a condition which probably results from partial absorption of the deposited adipose tissue. In the majority of the cases of pericarditis the condition was discovered only at autopsy, though in some of them an ante-mortem diagnosis was made, based upon retraction of the overlying tissues, friction sounds, etc. In none of the cases were any urgent symptoms produced by the condition.

Sclerosis of the valvular endocardium was met quite frequently, though in the majority of instances it was very slight in amount. Teissier maintains that this condition arises as the result of toxemia and not rarely produces mitral stenosis and other valvular lesions. Our experience does not accord with this view. Unfortunately, microscopic sections were not made of the heart valves which showed vegetations, so that it is not possible to state whether any of them were specifically tuberculous in origin. Recent vegetations were encountered twice on the mitral and once on the aortic valves.

A study of the clinical histories of two thousand three hundred and forty-four tuberculous cases reveals the following conditions:

Accentuation of the pulmonic second sound,.....	821
Accentuation of the aortic second sound,.....	428
Reduplication of the second sounds,.....	949
First sound at the apex lacking in muscular tone,.....	269
Irregular rhythm,.....	22
Intermittency,.....	8
Hypertrophy or dilatation of the right heart,.....	654
Hypertrophy or dilatation of the left heart,.....	62
Arteriosclerosis,.....	57
Tachycardia:	
(a) Pulse-rate 120 or over at first visit,.....	253
(b) Pulse-rate 130 or over at first visit,.....	154
Bradycardia—pulse-rate less than 65 at first visit,.....	36
Valvular lesions:	
Mitral insufficiency,.....	73
Mitral obstruction,.....	39
Both combined,.....	17
Aortic insufficiency,.....	10
Aortic obstruction,.....	15
Both combined,.....	1
Functional murmurs,.....	126
Subclavian murmurs,.....	5
Heart displaced downward,.....	12
Heart displaced to left,.....	7
Heart displaced downward and to left,.....	11

Heart displaced upward,.....	8
Heart displaced upward and to left,.....	5
Heart displaced upward and to right,.....	3
Heart displaced to right,.....	6
Dextrocardia,.....	5
Myocarditis,.....	2
No record of cardiac condition,.....	36

Accentuation of the pulmonary second sound at the base is a very common occurrence. This condition was noted at the pulmonary area eight hundred and twenty-one times in two thousand three hundred and forty-four cases; and at the aortic area four hundred and twenty-eight times in two thousand three hundred and forty-four cases. Owing to the close proximity of the two valves and the possibility of variations in the normal direction of transmission which may result from pulmonary consolidations, cardiac displacement, etc., it was not always possible to assert at which one the accentuation arose, but it was generally found that in those cases in which the increased sound intensity was noted at the aortic area some general systemic complication, such as nephritis or arteriosclerosis, existed. When, on the other hand, the pulmonary second sound seemed unduly loud, dilatation of the right heart, congestion of the lungs, extensive pulmonary involvement, etc., were often coincidentally noted. Among two hundred and thirty-four cases of accentuated aortic second sound evidences of nephritis were found in twenty-one (in twenty-four there were no data as to the condition of the urine).

Reduplication of the second sounds at the base occurred nine hundred and forty-nine times. It was considered that reduplication existed when the aortic and pulmonary sounds did not occur in absolute unison. This symptom is generally regarded as due to the asynchronism of the aortic and pulmonary portions of the second sounds, although other explanations have been offered. When, for example, blood-pressure is raised in the pulmonary circuit, "the right ventricle is, by reason of the increased blood-pressure in the right heart, first stimulated to contract, yet in consequence of the obstruction to the passage of blood through the

lungs, and the difficulty which the ventricle has in emptying itself, its systole is so prolonged that a sufficient amount of asynchronism is produced to allow of an appreciable interval between the aortic and pulmonary sounds" (Bramwell, "Diseases of the Heart," p. 164).

The asynchronous closure of the two valves is usually explained on the basis of unequal pressure. This is probably erroneous, for two reasons: first, the normal pressure ratio in the aorta and pulmonary artery is as three is to one respectively, and, secondly, Ceradini has demonstrated that the semilunar valves close as soon as the blood ceases to flow from the ventricle, and, further, that this occurs independently of pressure. Sahli has suggested another explanation, which lack of space, however, forbids our considering.¹

Arteriosclerosis was recorded only fifty-seven times in two thousand three hundred and forty-four histories (2.43 %). Inasmuch as only a few of our patients have been advanced in life, this small proportion is probably more significant than would at first sight seem evident. As already stated, Teissier has strenuously maintained that the toxin of tuberculosis is capable of producing this condition. If this is the case, it is probably not brought about by vascular spasm, for the reason that practically all observers have found blood-pressure subnormal in tuberculous patients—certainly not increased. Tuberculin itself possesses a vasodilator action. Arloing and Guinard² state that—"notre tuberculin A. —est montré—très vaso-dilatatrice, accellerante et affaiblissante du cœur." The recent work of Flick and Walsh would make it not unlikely that the arterial thickening of tuberculous individuals is not infrequently due to renal disturbances; probably syphilis and perhaps alcoholism are also factors in its production.

Balfour ("Diseases of the Heart," p. 33) states that the absence

¹Sahli, "Diagnostic Methods," 1905, p. 256.

²Cong. de la Tuberculose, 1898.

of pulmonary accentuation is conspicuous in cases of reduplicated second sound. This is entirely opposed to our experience, in which the latter condition was almost invariably associated with the former. Reduplication of the second sounds varies a good deal with the position of the patient, it being usually more marked, and at times present only in recumbency. This is interesting in comparison with the statement of Gibbes ("Edin. Med. Jour.," 1901, p. 155) that reduplication is more marked in the erect posture in cases of arteriosclerosis either with or without nephritis, and in adherent pericardium. It should be borne in mind, however, that the aortic second sound is normally weaker than the pulmonic in the horizontal position (v. Zeeheisen, "Centralbl. f. inn. Med.," 1899).

The first sound of the heart was recorded as lacking in muscular tone two hundred and sixty-nine times, although in the majority of cases no specific note was made on the subject, and doubtless the condition was tabulated only when present in marked degree. This statement is substantiated by the fact that the new history blanks, upon which this symptom condition is regularly recorded, show a relatively much larger number than was the case in the earlier cases. When we consider the strain to which the heart is subjected in pulmonary tuberculosis, not only from mechanical obstruction in the lungs but also from toxemia acting directly upon this organ itself, and indirectly through the kidneys, etc., it is not strange that cardiac weakness should often occur. That this loss of muscular tone is, however, functional in the majority of cases and not the result of organic disease is shown by the results of post-mortem examination. In one hundred and forty-three autopsies the heart muscle was normal in appearance macroscopically in one hundred and nine; in twenty-eight it was pale and flabby, and in six it appeared to have undergone fatty change. Microscopically only eighteen specimens were reported from the pathological department, the results being appended hereto. It should be stated, however, that in many of the cases

the examinations were unsatisfactory. For this reason minor changes may have been overlooked.

It will be noted that although increase in the connective tissue and fatty changes occurred in a number of instances, the amount of pathological alteration was usually very slight—in fact, quite insufficient to account for the clinical manifestations of cardiac weakness. We must, therefore, assume that these symptoms when encountered in tuberculosis are usually due to a functional incapacity, which in all probability results from general malnutrition and toxemia, and that the majority of murmurs heard in these cases are the result of relative insufficiency following relaxation of the mitral sphincter when they are heard at the apex; and that when they are heard at the base, they arise from pressure or constriction of the large vessels caused by inflammatory changes in the surrounding tissues. While valvular lesions and pulmonary tuberculosis are by no means rare as a coincidence, yet the frequency with which the former are found at autopsy is not sufficient to account for the large number of heart murmurs heard ante-mortem.

Hypertrophy or dilatation of the right heart occurred clinically in nearly 32 % of the cases; at autopsy it was recorded in over 21 %. Hypertrophy or dilatation of the left heart was noted clinically in 2.4 %, and post-mortem in 11.8 %. The discrepancy of these data in showing a larger proportion of cases of right-sided enlargement during life than is encountered at the necropsy is probably to be explained by the facts that retraction or consolidation of the lung is often apt to make the cardiac dulness relatively larger than it actually should be; further, that most of the fatal cases had been in bed for a considerable time before death, thus relieving the heart of considerable work, and allowing a dilated organ to recover its normal dimensions; finally, that individuals dying of tuberculosis often exhibit the most extreme grades of emaciation, in which condition the heart and pericardium naturally share.

In opposition to these explanations, however, is the undoubted fact that when the patient is erect, the heart tends to recede from the chest-wall, and minor grades of right-sided dilatation are more likely to be overlooked. The same may be said of heart murmurs, which, with the exception of those which result from aortic disease, are usually louder, and at times present only in the recumbent position. In every case in which an examination of the heart is made the fact should be definitely stated whether the data recorded were noted in the upright or the horizontal posture.

On the whole, the autopsies have taught us that the position and size of the heart can, in the majority of instances, be quite accurately determined by the ordinary methods of percussion and auscultation.

Under tachycardia were arbitrarily grouped those cases which had a pulse of 120 or more at the time of their first visit. From this group were separated those cases in which the pulse-rate was 130 or over at their first examination. Of the former class there were two hundred and fifty-three; of the latter, one hundred and fifty-four. In one early case a pulse-rate of 198 was recorded; this patient made but one visit, there being, therefore, no data as to the eventual outcome. The following facts were collected from the one hundred and fifty-six cases with pulse-rates over 130.

RELATION OF PULSE-RATE TO PROGRESS OF DISEASE.

156 cases with pulse- rate over 130,....	{	Disease far advanced,	{	Improved,.....	2
			Improved with slowing pulse, ..	5	
			Became worse,.....	46	
			Only one visit,.....	29	
	{	Disease moderately ad- vanced,.....	{	Improved,.....	2
			Improved with slowing pulse, ..	5	
			Became worse,.....	18	
			Only one visit,.....	12	
	{	Disease in early stage,.....	{	Improved,.....	8
			Improved with slowing pulse, ..	9	
			Became worse,.....	8	
			Only one visit,.....	12	

It is an established but insufficiently recognized fact that a persistently rapid pulse is a very unfavorable feature in a case of tuberculosis, and that unless this symptom can be abated by the proper treatment, the disease is apt to go from bad to worse. Campbell ("Brit. Med. Jour.," June 1, 1901) states that among the working classes a week's rest in bed will usually reduce the pulse-rate about twenty beats; and that cases in which such a rest brings the rate below 100 are, other features being considered, favorable cases for sanatorium treatment. Cases with cavities formed and a pulse-rate of 84 are also likely to do well. A pulse of 100 usually means an evening temperature of 101° or over, but, of course, allowance must be made for excitement at the time of the first examination. The foregoing figures are, of course, too small for broad deductions, but they show the deleterious influence of tachycardia which evinces itself no less in early than in late cases. A satisfactory consideration of the etiology, etc., of tachycardia is not within the scope of the present paper; for a discussion of the subject the reader is referred to an article by the author in the "Zeitschrift für Tuberculose und Heilstättenwesen," 1905. Cases with a pulse-rate below 65 were also collected. The majority of these had either normal or subnormal temperatures. The lowest rate recorded was 40. These cases when analyzed stand out in marked contradistinction to those with tachycardia. In a total of thirty-two cases, thirteen improved, four remained stationary, fourteen paid only one visit, one became worse.

As has already been mentioned, the relationship of pulmonary tuberculosis and valvular disease of the heart has been the subject of considerable discussion. A glance at the tabulation will show the frequency with which the two conditions occurred coincidentally in our series of cases. Mitral lesions were found to preponderate over the aortic. This was due, in part, to the fact that most of our cases occurred in relatively young people in whom aortic disease is rare, and partly because, for anatomical and physiological reasons, disease of the heart following upon disease

of the lungs is more apt to affect the mitral valve. We have endeavored in our statistics to exclude from the categories just discussed all functional—hemic, cardiorespiratory, etc.—murmurs, and have given separate consideration to these. It will be noted that organic changes in the heart and lungs occurred coincidentally in 10.3 % of the cases. During the past year I was able to collect from the literature and the records of the Phipps Institute clinical records of fifty-one thousand nine hundred and ten cases of tuberculosis of the lungs; in 1.3 % of these valvular heart disease coëxisted; and among eight thousand one hundred and fifty-one tuberculous autopsies, the two conditions were coincidentally found in 3.9 %, showing apparently that the tendency of clinical records is rather to underestimate than to overestimate the frequency of the conditions; and this despite the fact that mitral insufficiency resulting from relaxation of the mitral ring is apt to be unnoticed at autopsy.*

Functional murmurs are, for obvious reasons, of frequent occurrence. They were noted with almost equal frequency at the apex and at the base. They sometimes simulate organic murmurs by the direction of their transmission, if consolidated lung tissue exists near the seat of their origin, for which reasons the heart sounds are themselves sometimes transferred to distant parts of the chest. Subclavian murmur was recorded only six times; its presence or absence is, however, not routinely recorded, and I have no doubt that it occurred more often. This murmur is usually accounted for constriction or compression of the artery, due to adhesions, enlarged lymph-nodes, or pulmonary consolidation; it is often very loud and high-pitched, rather short in duration, with an ictus at its incipience like the sound of escaping steam, but is not usually transmitted into the brachial or axillary arteries.

Tuberculosis is the commonest cause of non-congenital cardiac displacement. It is believed that the figures tabulated in this

* "Tuberculosis and Heart Disease," "American Jour. of Med. Sciences," Oct., 1904.

paper, for reasons already stated, falls short of the actual frequency of the condition. It is, however, interesting to note that complete dextrocardia was recorded in five instances. This condition occurred in cases in which there were marked fibrosis and contraction of the lungs and pleuræ.

A fact not sufficiently recognized by the profession is the vast and important rôle which the heart plays in the course, character, and curability of pulmonary tuberculosis. Valvular lesions, if well compensated, apparently exert no especial influence upon the tuberculous process, with the exception of pulmonary stenosis, which seems to lead to an invariably fatal termination, and probably acts as a predisposing cause in the first place. But cardiac weakness and functional incapacity, whether the result of congenital hypoplasia, dilatation, toxemia, or myocardial degeneration, exercise the most deleterious influence. I have been impressed with the fact that athletes, men of superb musculature and herculean physique, often succumb rapidly to tuberculosis, pneumonia, and acute infectious diseases, such as typhoid fever, apparently as the result of cardiac weakness. It would seem as if the strain upon the heart, in athletic contests, which calls forth hypertrophy and dilatation, uses up too much of the normal reserve force, and when, in the course of disease, a call comes for additional and prolonged muscular power, the depleted physiological capital is no longer commensurate with the demands, and a state of bankruptcy ensues.

Tachycardia in tuberculosis is an unfavorable symptom, calling for energetic and careful treatment, and unless it can be abated by proper measures, the treatment of the tuberculous process will almost certainly be unsatisfactory. In every case of pulmonary tuberculosis careful attention should be given to the condition of the heart, this factor being of no less importance than the state of the digestion, and both conditions being in no small measure interdependent. The digestion will often improve if the heart condition is looked after, and the heart will frequently gain in strength and functional efficiency if constipation, flatulence, etc., are overcome.

COMPARISON OF CLINICAL DATA, MACROSCOPIC APPEARANCE, AND MICROSCOPIC EXAMINATION IN NINETEEN CASES.

CLINICAL DATA OF CARDIAC CONDITION.	MACROSCOPIC APPEARANCE OF THE HEART AT AUTOPSY.	MICROSCOPIC EXAMINATION OF THE HEART MUSCLE.
CASE No.		
2668. Sounds and position normal. Pulse-rate, 120 to 170.	Weight, 248 grams. Dilatation of the right ventricle.	Some granulation of fibers.
2213. Action rapid, sounds feeble. Pulse, 120 to 130.	Weight, 186 grams; bifid apex, slight pericardial thickening. Muscle normal.	Slight amount of fatty degeneration.
1344. Rapid, overacting, pulmonic second sound accentuated and reduplicated.	Weight, 155 grams; milk spots on left ventricle; muscle pale and flabby.	Slight increase of connective-tissue nuclei between fibers. Cross striæ of fibers well marked.
2582. Dilatation of right heart. No murmurs. Accentuation of pulmonic and aortic. Pulse, 140 to 170.	Weight, 109 grams; tubercle size of pea, posterior surface pericardium. Dilatation of both ventricles (aged six).	Some edema; slight increase of connective tissue between fibers.
2468. Size and position normal. Sounds weak. Pulmonic accentuated. Pulse, 100 to 130.	Weight, 155 grams; atheroma of aorta, gelatinous degeneration of pericardium (aged thirty-five).	Some fatty degeneration beneath endocardium.
2416. Normal, no murmurs. Pulse, 90 to 110.	Weight, 271 grams; muscle congested; gelatinous degeneration of pericardium.	Slight granulation of fibers with loss of striæ.
2104. Died within twenty-four hours of admission. No record.	Hypertrophy and dilatation of both sides of heart.	Thickening of intima of pericardial vessels. Pericardial fat shows infiltration of connective-tissue cells.
2295. Sounds, position, normal. Pulse, 120 to 130.	Weight, 357 grams.	There is apparently an increase in the connective-tissue nuclei between the fibers.
2564. Aortic and pulmonic second accentuated; dulness enlarged, pulmonary systolic. Pulse, 110 to 125.	Weight, 233 grams; pale, flabby. Thickening of mitral leaflets and chordæ tendineæ; gelatinous degeneration of pericardium.	Slight thickening of the intima of the vessels of the pericardium.

945.	Sounds, size, position, normal. Pulse, 90 to 140.	Weight, 171 grams; muscle firm.	Some increase of connective tissue and few round-cells in trabeculae. Degeneration of muscle-cells.
1157.	Normal. Pulse, 80 to 110.	Weight, 264 grams; recent pericardial adhesions, milk spots; dilatation of right ventricle. Fatty degeneration of muscle.	Some increase in connective tissue throughout. Some fatty degeneration.
2102.	Dilatation. Systolic murmur at aortic. Muscular sounds feeble. Pulse, 120.	Weight, 202 grams; normal.	No marked change.
1568.	First sound at apex feeble. Aortic second accentuated. Pulse, 100 to 130.	Weight, 248 grams; fatty degeneration of muscle; atheroma of aorta (aged forty-four).	No marked change.
2477.	Pulmonic second accentuated. Muscular sound normal. Pulse, 100 to 120.	Weight, 207 grams; muscle pale.	No marked change.
2280.	Good muscular sound. No murmurs. Pulse, 110 to 120.	Weight, 171 grams; muscle pale and flabby.	No marked change.
2657.	Normal. Pulse, 110 to 150.	Weight, 186 grams; muscle flabby; petechiae on visceral and parietal pericardium.	Normal.
2855.	Aortic second accentuated. Dextrocardia. Pulse, 110 to 120.	General ventricular hypertrophy; dilatation of right ventricle. Valves normal, muscle firm, dark red.	Moderate capillary congestion, slight nuclear hypertrophy, practically normal.
2664.	Negative. Pulse, 110 to 140.	Enlarged; hypertrophy of left and dilatation of right side.	Capillaries distended. Nuclear hypertrophy. Slight increase of intermuscular fibrous tissue. Transverse markings clear.
2980.	Pulmonic and aortic second sounds accentuated. Pulse, 110 to 150.	Weight, 403 grams; dilatation of right heart.	Greatly congested. Slight perinuclear pigmentation. Few hypertrophied nuclei.

As to the treatment of heart weakness in tuberculosis, my experience has taught me that, as in the treatment of other symptoms in this disease, drugs should be used as little as possible. Rest in bed, regulation of the bowels, an ice-bag to the precordium, Nauheim baths in cases with dilatation, have been found most useful. Among the drugs, nitroglycerin, strychnin, and caffein have been of the greatest benefit. Theoretically, the first is usually not indicated, since the blood-pressure is already subnormal; practically, however, its administration is attended with excellent results. Digitalis, strophanthus, and camphor, as a rule, do little good. The first two are very uncertain in their action upon all febrile and it seems upon tuberculous cases; the last is constipating, and all of them tend to upset the digestion. Of course, there are exceptions to the rule laid down here, but as a general thing it applies; not to those cases, however, in which there is organic valvular disease.

GEORGE W. NORRIS.

THE LIVER IN TUBERCULOSIS.

History.—Tuberculosis of the liver was considered a very rare manifestation by the older observers. Louis¹ in 1843 found it in only two of one hundred and twenty cases of pulmonary tuberculosis. Forster² in 1854 found it in only three in a great many cases examined. Bristowe³ in 1858 found, in an examination of livers relative to the frequency of liver abscess following intestinal ulceration, that, in one hundred and sixty-seven cases of tuberculous ulceration of the intestines, there were but twelve cases of tuberculous “*cavities*” in the liver. Waldenberg⁴ in 1869 reports that it is the organ most frequently affected in experimental tuberculosis, but this is probably due to the mode of infection, as the infective material is usually thrown into the peritoneal cavity and the susceptibility of the liver in various animals would also be a determining factor.

As we come nearer to the present time we find that, owing to the more careful and searching examinations, particularly by means of the microscope, the lesions of tuberculosis in the liver are more frequently found.

Arnold⁵ in 1880 considers it an almost constant factor in cases of tuberculosis. Simmonds⁶ in 1888 found it in 76 % in adults, 92 % in children, and 78 % in general.

Zehden⁷ in 1897 found miliary tubercles in 50 % of fatal cases of pulmonary tuberculosis, corresponding with the frequency of intestinal ulceration. Rolleston⁸ in 1903 thinks it occurs in less than 50 % of cases.

We report only thirty-seven cases, as the work was not undertaken until mid-year, and we were unable to obtain the livers of the cases previously autopsied. In our series, comprising thirty-seven cases, we found tubercles thirty times, or a trifle over 81 %.

Of these thirty livers, nine had atypical lesions, the tubercles lacking the giant-cells, but showing round-cells, epithelioid cells, and caseation. In the remaining twenty-one cases the lesions were typical.

That typical tubercles would have been found in every one of the thirty cases is probable had sections enough been made. A great many sections were made of each liver, and in a number of instances the first sections showed atypical lesions, while later specimens gave the characteristic picture, including the giant-cell.

All the livers were stained for tubercle bacilli, and the bacteria were found in six cases. In three cases they were present in large numbers, two of these being cases of miliary tuberculosis, and the third containing miliary tubercles and caseous nodules, and on the periphery of the latter bacilli were found. In the other three cases only two or three bacilli were found, but they were characteristic. The infrequency of this finding was surprising, but many observers have had the same experience. Baumgarten⁹ found them infrequently in experimental tuberculosis, and Brisard and Loupet,¹⁰ Hanot and Lauth,¹¹ Wessner and Koeckel,¹² found them very rarely.

Clinical Recognition.—Fraenkel¹³ in 1882 published four cases, in all of which he diagnosed hepatic tuberculosis clinically and it was confirmed at autopsy. One was a case of chronic pulmonary tuberculosis, one was a case of caseous pneumonia, and the remaining two were cases with typhoidal symptoms in which a diagnosis of acute miliary tuberculosis was made. The diagnoses in these cases were made on jaundice, tenderness over the liver, and enlargement. Fraenkel thinks that in cases of chronic pulmonary tuberculosis or in cases with typhoidal symptoms the appearance of jaundice, especially when accompanied by tenderness over the liver and hepatic enlargement, is a sufficient ground for a diagnosis of tuberculosis of the liver.

MacKenzie¹⁴ in 1890 reports a case of chronic phthisis in which there was clinically pain in the hepatic region and the organ was enlarged an inch below the costal margin. At autopsy a huge

cavity was found in the right lobe of the liver, which was shrunken. This cavity contained some pultaceous matter and was defined in part by a fibrous capsule and in part by liver substance.

Waring¹⁵ speaks of tuberculous abscesses of the liver, but says they are without clinical manifestation.

Ransohoff¹⁶ reports a case of tuberculoma of the liver which was palpable through the abdominal wall and which was removed by operation. In this case the patient had previously had a testicle removed for tuberculous disease, and although the tumor did not show tubercle bacilli, it was diagnosed a tuberculoma. Wagner¹⁷ never saw jaundice associated with cases of tuberculosis. He found enlargement of the liver and tenderness in the hepatic region characteristic of tuberculosis and especially of acute miliary tuberculosis.

Zehden thinks that the clinical manifestations of hepatic tuberculosis amount to nothing, as he has seen no case of jaundice in two hundred and twenty-five cases of phthisis autopsied.

He discusses at some length the cases of Fraenkel and his diagnosis of them. Fraenkel thought the jaundice in one of his cases was hematogenous, analogous to the jaundice of the acute infections, but was not at all convinced that it was so, as the presence of jaundice is so rare in acute tuberculosis.

He also suggests that it may be due to a fibrous hepatitis whose advent is coincident with that of the miliary tubercles and which is of a tuberculous nature. He discusses the possibility of an obstruction of some of the finer bile-ducts by the miliary tubercles, but does not think this occurs.

Zehden does not believe in hematogenous origin for the jaundice, neither does he think it is the result of a fibrous hepatitis, and he is extremely skeptical in regard to the possibility of recognizing hepatic tuberculosis by clinical signs.

Rolleston thinks that it is impossible to diagnose tuberculosis of the liver with any degree of certainty, and thinks, with the majority of other observers, that clinical symptoms are rare.

In our series jaundice was present twice in thirty-seven cases. In one case (No. 2252) slight jaundice was noted one month before death and no further observations about it are made in the record, so we are bound to conclude that it lasted but a short time. There was in this case associated enlargement of the liver to two finger-breadths below the costal margin, and also marked tenderness, but a diagnosis of hepatic tuberculosis was not made.

At autopsy miliary tubercles were found associated with a marked degree of congestion, and it is to this latter rather than to the former that we are inclined to look for an explanation of the tenderness and increase in size.

In the other case (No. 2662) jaundice came on about one month before death and persisted. In this case jaundice was marked and was associated with enlargement of the liver, presence of bile in the urine, and clay-colored stools.

Autopsy revealed a moderately enlarged liver containing yellowish-white nodules, varying in size from a pin-head to a pea, scattered throughout the liver, which were apparently tubercles. Microscopically these proved to be caseous areas surrounded by small round-cells and epithelioid cells, and tubercle bacilli were found on their periphery. There were also typical miliary tubercles seen.

In none of our other cases was there jaundice. In six of our cases there was tenderness over the liver. One of these was No. 2582 in our series, a child seven years old, in whom there was hepatic enlargement, and the liver showed microscopically tubercles in the periportal spaces. One was case No. 1577, which showed marked amyloid change and typical tubercles. One was case No. 2252, which showed marked congestion and typical tubercles.

Of the other three, two showed mitral stenosis (cases No. 2701 and No. 2180) and the third (case No. 2446) showed a systolic murmur at the apex and at the aortic cartilage, and, as there was coincident enlargement of the liver in two of these cases, it would

be logical to attribute the pain and tenderness to passive congestion the result of the cardiac condition.

Enlargement of the liver was charted in twelve cases of the thirty-seven, and in three of these moderate congestion and typical tubercles were found, two showed moderate congestion and a marked degree of fatty change associated with typical tubercles, two showed moderate congestion and atypical tubercles, one showed moderate congestion and no tubercles, one showed a marked degree of amyloid change associated with tubercles, one showed moderate congestion, typical tubercles in the periportal spaces associated with the formation of new bile-ducts, one showed a great number of large caseous areas surrounded by small round-cells and associated miliary tubercles, and one showed miliary tubercles alone.

In only three of these cases would it have been possible to have made a diagnosis of hepatic tuberculosis clinically according to the autopsy findings, as there were only three specimens in which there was not an associated condition to which we would be more apt to refer the enlargement. From a consideration of the clinical and pathological findings in these cases and from a perusal of the reports of other observers it must be concluded that a clinical recognition of hepatic tuberculosis is rarely if ever justified. In those cases in which jaundice has occurred we have been unable to say how it was caused, or, indeed, to say that it was due to the tuberculous process, while tenderness and enlargement are more apt to arise from other causes, namely, fatty change and passive congestion.

Mode of Infection.—The infection may take place in utero, as witness a case reported by Sabouraud and referred to by Zehden, in which there was miliary tuberculosis of the liver and spleen in an infant eleven days old, in whose mother there was phthisis pulmonalis but no genital or mammary tuberculosis. He concluded that the infection traveled by way of the umbilical vein. No-card, according to Zehden, also reports a case of liver tuberculosis

in a calf in whose mother's placental cotyledons there were tubercles containing giant-cells.

Von Honl¹⁸ found tuberculosis in the liver and other organs in a fifteen-day-old child in which the tubercles undoubtedly antedated birth. His reason for believing that they were older than fifteen days was the amount of fibrous change that had taken place around the lesions.

In the adult liver it is possible that the infection travels by way of the blood-vessels. Simmonds,¹⁹ however, does not accept this opinion. He claims that the infection travels by way of the bile-ducts, coming from the duodenum, traverses and pierces the wall of the duct without injuring that structure (as it has been proved to do through other normal membranes, as the intestine), and sets up its characteristic lesion in the parenchyma. The tubercle involves the bile-duct by extension, breaks through the wall of that structure, and the caseous, broken-down tissue forming its center is extruded into the bile-duct and in this way reinfects it. He considers the so-called bile-duct tubercles as analogous to caseous peribronchitis.

Orth, according to Kotlar,²⁰ thinks that the infection travels from the portal vein by way of the lymph-channels.

Sabouraud, according to the same author, considering only the so-called bile-duct tubercles, thinks that the infection comes, not by way of the bile-ducts, but by way of the blood; that the bile-ducts are very resistant to the tuberculous process and are the last structures to be involved.

Kotlar himself made very careful examinations of tuberculous livers, histologically and bacteriologically, and came to the conclusion that the infection is hematogenous and does not come by the bile-ducts.

Zehden agrees with Kotlar, and goes further: He states that the infection in chronic and in acute tuberculosis is by different channels. In chronic tuberculosis it travels by the arteries and in acute by the veins. He thinks the initial foci are in the tissue

supplied by the smallest blood-vessels, and that thence the infection is carried by the lymph-stream. The smallest vessels in the liver are in the intermediate zone of the acini, and it is here that the bacilli are apt to lodge and set up the lesion.

Klebs, according to Zehden, believes the infection in chronic tuberculosis begins in the middle zone of the acini and spreads peripherally via the lymph-channels. He believes that the infection can travel against the lymph-stream.

Kotlar shows rather conclusively that the infection does not take place via the bile-ducts. He was never able to find the tubercle bacilli in bile.

Letienne, quoted by Kotlar, found tubercle bacilli in the bile only once in twelve cases. In careful sections of the tuberculous livers Kotlar found these so-called bile-duct tubercles, where the tubercle had broken into the bile-duct and the tubercle was bile-stained, but he was unable to find giant-cells or false giant-cells in the walls of the ducts. He thinks the growth of the tubercle gradually involves the wall of the bile-duct by extension from the parenchyma.

In our cases an attempt was made to classify the tubercles according to the position they occupied in the parenchyma. Of the thirty cases in which tubercles were found, eleven were found to be intra-acinal, ten were periportal, and in nine cases the tubercles were both intra-acinal and periportal. In two cases of acute miliary tuberculosis they occupied both positions. In no case was there found a rupture into the bile-duct.

Varieties.—1. The miliary tubercle is the most common variety found in the liver, and all our cases but one were of this type.

2. The so-called bile-duct tubercle. In this affection, according to Zehden and Rolleston, the bile-ducts are surrounded by caseous masses which have broken through the wall of the duct, and the caseous material occupying the center of the tubercle may be bile-stained or possibly blood-stained from hemorrhage, or if

the caseous material has been extruded into the duct, the resulting cavity may be bile-stained or blood-stained.

Kotlar and Zehden think that the name bile-duct tubercle is a misnomer, as they consider the infection a hematogenous one, and think the duct is only secondarily involved by extension. The cavity formed by the expulsion of the caseous material into the duct has usually a capsule composed of the fibrous tissue surrounding the portal spaces, and the cavity is surrounded by a caseating area.

The caseating areas are usually one-sixth to one-fourth of an inch in diameter. The cavities may attain considerable size and may measure one to two inches in diameter. The ducts outside the liver substance—the hepatic, the cystic, and the common duct—are rarely involved, according to Rolleston, although sometimes the glands adjacent to those ducts are. Koester²² reports the case of a boy who had jaundice due to the pressure of the glands on the common duct. In this case the boy had a tuberculous pneumonia and the liver showed miliary tubercles.

3. Solitary tubercle. According to Rolleston, this variety consists of large masses which are not found in the periportal spaces. It is very common in some animals. In 20 % it is the only organ affected in birds. In bovines also large masses are found in the liver. This form of tuberculosis is frequently found in the liver of the monkey. It is very rare in human beings, but less rare in children than in adults.

This same author (Rolleston) reports a case in a boy of eight. Large masses were felt in the liver during life. He was admitted to the hospital with pericarditis and renal disease, and developed tuberculous foci of the limbs, skull, and vertebræ. The large masses in the liver were unstained with bile.

Moore reports a case in which there was cancer of the stomach, and large masses developed in the liver, the supposition being that the absence of hydrochloric acid from the stomach and the ulcerated surface in that organ presented a combination especially

fitting for the entrance of the tubercle bacillus. Clement²² describes an almost similar case.

These solitary masses are easily enucleated and resemble gummata. The masses may soften and produce abscess-like areas.

4. Conglomerate Tubercle.—This variety is very rare. Orth²³ reports two cases, in one of which the patient had miliary tuberculosis and also a large caseous nodule in the liver. Microscopic examinations were not made, but Orth thinks there was no doubt as to the diagnosis. Zehden and Simmonds both attack his diagnosis and think it was probably a gumma, with coincident miliary tuberculosis. In his second case there was a similar condition. There was in this case a caseous nodule as large as a hen's egg in a liver in which there were miliary tubercles. Simmonds and Zehden both dispute the correctness of this diagnosis, and think he was dealing either with a gumma or a cancer with a coëxisting miliary tuberculosis.

Simmonds publishes two cases, in one of which there was a spondylitis, tuberculous pericarditis and pleuritis, and a nodule the size of a hen's egg in the liver. There were tubercles in the liver and no involvement of the bile-ducts, the liver vessels, or the gastro-intestinal canal. Microscopically a structureless mass was found, in whose center were the remains of giant-cells.

In his second case, pea-sized to goose-egg nodules were found with caseous centers. They were sharply defined from the surrounding structures. Microscopically giant-cells and tubercle bacilli were found. The second case was notable for the amount of destruction which had taken place.

Coincident Pathological Processes.—1. Amyloid degeneration. This is a more or less frequent occurrence in chronic tuberculosis, not only of the lungs, but also of the bones. In our thirty-seven cases it appeared but four times, or in about 11 %. Two cases were well marked and the other two showed it only in a slight degree.

2. Fatty change in the liver has been the subject of much dis-

cussion. Langerhans thinks it is due to a paralysis of the hepatic cells and that the fat physiologically stored there is not given up. Klebs thinks it is the direct result of the tuberculous process on the lymphatic apparatus of the liver, the lymph outflow being hindered and the fat retained.

In our series it occurred in nine cases out of thirty-seven, or about 24 %. In the cases examined it was impossible to determine the cause.

Congestion.—The occurrence of congestion in the liver is, of course, not characteristic of this disease, and yet it is an almost constant finding.

In chronic lung disease the embarrassed respiratory apparatus with its effect upon the right heart sooner or later gives rise to passive congestion. The liver, with its close proximity and its blood-supply, is one of the first organs to show the change.

In our cases we classified the congestion as slight, moderate, and marked. There were eight cases of slight congestion, twenty-three in which it was moderate, and four in which it was very marked. Only two showed an absence of congestion.

Cirrhosis.—Cirrhosis of the liver may accompany tuberculosis and be due to an entirely independent cause. For instance, we may have an alcoholic cirrhosis, superimposed upon a tuberculous infection. We may also have cirrhosis of the liver with tuberculosis elsewhere in the body, but it has long been felt that there was a fibrous hepatitis due to the tubercle bacillus. Brieger²⁴ in 1879 described a fibrous hepatitis occurring in tuberculous patients, with the formation of fibrous tissue which inclosed the lobules, together with newly formed bile-ducts. Arnold also speaks of newly formed bile-ducts.

Rolleston discusses at length cirrhosis of the liver associated with tuberculosis. He quotes Hanot and Gilbert, who describe a large fatty liver with a small-cell infiltration and fibrous hyperplasia of the portal spaces, together with miliary tubercles. This they call "hypertrophic fatty tuberculous hepatitis."

These authors describe two other forms: (a) Cirrhosis without any enlargement of the liver. (b) Cirrhosis with more fibrous tissue than the variety just mentioned—that is, cirrhosis without enlargement of the liver—but with similar fatty change, and tuberculous infiltration. The two latter forms differ only in the fact that one shows marked nodules, like those seen in cirrhosis with adenomata. Rolleston thinks these forms occur, but he does not think them tuberculous. He considers it reasonable to suppose the tubercle bacillus capable of a sclerogenic effect in the liver.

In animals, as in guinea-pigs, Hanot and Gilbert were able to produce a cirrhosis of the liver by the injection of avian tubercle bacilli; while human bacilli produced fatty change or coagulation necrosis. Hanot found a deeply scarred liver, like that of acquired syphilis, associated with miliary tubercles in the organ.

Collet and Gallivardin, according to Rolleston, report a case of tuberculosis of the portal spaces with a delicate fibrosis accompanying.

Mixed infection, according to Rolleston, may set up a gastritis and a consequent dyspeptic type of cirrhosis. A marked grade of passive congestion may set up a cirrhosis—the so-called cardiac cirrhosis.

In seven of our cases we found newly formed bile-ducts, but in only one of the seven was there coincident increase of fibrous tissue, and in this case the increase was but slight. This was case No. 2662, in which there were marked jaundice and enlargement of the liver clinically and the physical signs gave evidence of cavity formation in the lungs.

At autopsy the liver was found enlarged, weighing 1950 gm.; it was denser than normal and the edges were rounded. On section small, yellowish-white nodules were seen scattered throughout the organ. These nodules were from pin-head to pea size. Some of them seemed to be coalesced. The gall-bladder was distended and the bile-duct patulous.

Microscopically there were large caseous areas in the liver without giant-cells, but there were tubercle bacilli in these areas, and there were typical miliary tubercles with giant-cells. There was also a slight increase in the amount of fibrous tissue, there being prolongation of fibrous tissue from about the branches of the portal vein. This was not marked, and there was nowhere a definition of a lobule by the fibrous tissue. There were also newly formed bile-ducts. In the other six cases in which there were newly formed bile-ducts there was no increase of fibrous tissue.

In only three cases was there increase of fibrous tissue, case No. 2662, just described, and cases Nos. 2899 and 3010.

Case No. 2899 showed a moderate increase of fibrous tissue, the fibrous tissue extending from about the portal vein between the hepatic cells and giving the appearance of tendrils or processes of the periportal fibrous tissue. Nothing abnormal in the liver was found clinically, and at autopsy it was described as firm and containing whitish areas, of which some were coalesced. There were typical tubercles found microscopically, and no newly formed bile-ducts. There was in one place an inclusion of hepatic cells by the fibrous tissue, but the area was very small and the cells seemed normal.

Case No. 3010 showed clinically slight enlargement, but no tenderness, and was diagnosed as cirrhosis of the liver. From macroscopic appearance fatty cirrhosis and acute miliary tuberculosis were recorded at autopsy. Microscopically miliary tubercles showing tubercle bacilli were found, and there was a slight increase in the amount of fibrous tissue, there being prolongations of the periportal fibrous tissue between the hepatic cells.

In none of these three cases was the increase of fibrous tissue decided, but it was sufficient to be very interesting and to give rise to speculation as to its origin. In case No. 2662 there was a history of alcoholism, and although the patient denied specific infection, there was reasonable doubt in the mind of the examiner as to the

truth of this statement. Case No. 2899 had no alcoholic or specific history, but case No. 3010 had always been a very hard drinker and had had syphilis.

With a very pronounced alcoholism in two cases we should not hesitate to ascribe whatever fibrous change had taken place in the liver to alcohol rather than to the tuberculous process. In case No. 2899, in which there was no history of alcoholism or of syphilis, there is a possibility that the fibrosis was due to the tubercle bacillus, yet we hesitate to state that it is more than a possibility.

In conclusion we may say: 1. That tuberculosis of the liver is found in a large percentage of cases dying of pulmonary tuberculosis.

2. That its clinical recognition is only rarely, if ever, possible.

3. That the infection probably takes place by the blood-vessels, the bacilli being carried to the liver by the portal vein or the hepatic artery.

4. That passive congestion of the liver is found in nearly every case of pulmonary tuberculosis, while amyloid and fatty change are found in a relatively small number of cases.

5. From our cases we are not convinced that a fibrosis or cirrhosis of the liver due to the tubercle bacillus does occur, and are more inclined to think that the fibroses found are due to other etiological factors.

CLINICAL SYMPTOMS.

	NUMBER FOUND.
Cases in which jaundice was present,.....	{ No. 2252 } { No. 2662 } 2
Cases in which there was tenderness over the liver,.....	{ No. 2252 } { No. 1577 } { No. 2582 } { No. 2701 } { No. 2180 } { No. 2446 } 6

TUBERCLES IN THE LIVER.

Case in which tubercle bacilli were found,.....	{ No. 2582 only a few. No. 2668 large numbers. No. 714 only a few. No. 232 only a few. No. 2662 large numbers. No. 3010 large numbers.	
Cases in which the tubercles were typical,.....	{ No. 2252 No. 714 No. 2356 No. 232 No. 1577 No. 236 No. 2564 No. 2662 No. 2582 No. 2446 No. 2668 No. 2602 No. 501 No. 2180 No. 1032 No. 2815 No. 2538 No. 2796 No. 2657 No. 2856 No. 3010	21
Case in which the tubercles were atypical, lacking the giant-cells,.....	{ No. 1157 No. 2787 No. 2102 No. 2899 No. 2701 No. 2821 No. 2494 No. 2855 No. 2596	9
Cases in which no tubercles were found,.....	{ No. 2046 No. 2716 No. 282 No. 551 No. 2576 No. 2926 No. 2689	7
		37

LOCATION OF TUBERCLES.

Cases in which the tubercles were intra-acinal,.....	{ No. 2252 No. 2815 No. 1577 No. 2494 No. 714 No. 2787 No. 232 No. 2899 No. 2662 No. 2855 No. 2602	11
Cases in which the tubercles were periportal,.....	{ No. 1157 No. 2701 No. 2582 No. 2180 No. 2564 No. 236 No. 2102 No. 2796 No. 2538 No. 2821	10
Cases in which the tubercles were both periportal and intra-acinal,.....	{ No. 2356 No. 2446 No. 2668 No. 2596 No. 501 No. 2856 No. 1032 No. 3010 No. 2657	9

MICROSCOPIC FINDINGS IN ENLARGEMENT.

Cases in which the liver was enlarged clinically, 12,.....	No. 2356 No. 2180	} Typical miliary tubercles, fatty change, moderate congestion.
	No. 2252 No. 2538 No. 2602	} Typical miliary tubercles and moderate congestion.
	No. 2787 No. 2821	} Atypical miliary tubercles and moderate congestion.
	No. 2716	} Moderate congestion and no tubercles.
	No. 1577	} Typical miliary tubercles, marked degree of amyloid, moderate congestion.
	No. 2582	} Typical miliary tubercles, newly formed bile-ducts, and slight congestion.
	No. 2662	} Numerous caseous areas surrounded by small round-cells. Typical miliary tubercles also seen.
	No. 3010	} Typical miliary tubercles, increased fibrous tissue.

CONGESTION OF LIVER.

Cases showing congestion, 35	Slight,	<div> <div>No. 1577 No. 2356 No. 2668 No. 2102 No. 2602 No. 2494 No. 3010 No. 2796</div> <div>8</div> </div>
	Moderate,	<div> <div> <div>No. 1157 No. 2252 No. 2046 No. 2564 No. 282 No. 2576 No. 501 No. 1032 No. 2689 No. 2538 No. 2657 No. 2716</div> <div> <div>No. 232 No. 236 No. 2701 No. 2446 No. 2180 No. 2815 No. 2596 No. 2787 No. 2899 No. 2821 No. 2856</div> </div> <div>23</div> </div> </div>
	Marked,	<div> <div>No. 714 No. 551 No. 2926 No. 2855</div> <div>4</div> </div>
	Cases showing no congestion,	<div> <div>No. 2582 No. 2662</div> <div>2</div> </div>

HISTOLOGICAL CHANGES.

Cases showing amyloid change,	<div> <div>No. 1577</div> <div>No. 2102</div> <div>No. 236</div> <div>No. 714</div> </div>	4
Cases showing fatty change,	<div> <div>No. 2356</div> <div>No. 501</div> <div>No. 1032</div> <div>No. 2689</div> <div>No. 2180</div> <div>No. 2494</div> <div>No. 2596</div> <div>No. 2796</div> <div>No. 2716</div> </div>	9
Cases showing newly formed bile-ducts,	<div> <div>No. 2356</div> <div>No. 2582</div> <div>No. 501</div> <div>No. 2538</div> <div>No. 2662</div> <div>No. 2494</div> <div>No. 2796</div> </div>	7
Cases showing increased fibrous tissue,	<div> <div>No. 2662</div> <div>No. 2899</div> <div>No. 3010</div> </div>	3

CASES.

Case No. 1157. Admitted 8—3—'03. Died 6—3—'04. Physician, Stanton. Female. White. Widow. Irish. Age, thirty-four. Occupation, housework. Source of infection, husband. Previous diseases, not recorded. Principal symptoms, cough, expectoration, dyspnea on exertion, and hoarseness. Highest weight, not recorded; weight at death, ninety-one and one-quarter pounds. Heart sounds distant and weak. No increase in heart dulness. No increase in size of liver or spleen. Sputum, positive for tubercle bacilli. Urine, 1010, no albumin, no sugar; microscopically, leucocytes and squamous epithelium. Diagnosis, pulmonary and laryngeal tuberculosis.

Pathological diagnosis, Rosenberger: Miliary tuberculosis of both lungs with cavity formation; emphysema and congestion of lungs also present; infarct of left kidney; catarrhal appendicitis.

Liver, weight, one thousand four hundred and twenty-six grams; darker than normal. Consistence, firm. Red atrophy. Microscopic appearance: A marked grade of congestion, so marked that the liver-cells are atrophied in places; two tubercles seen—one is immediately adjacent to the portal vein; it does not involve the wall of the vein; there are no typical giant-cells, but in the center there are the remains of giant-cells; on the periphery there are large numbers of small round-cells and a few epithelioid cells. This tubercle is surrounded by a fairly well-defined capsule of fibrous tissue; the other tuber-

cle found was apparently intra-acinal and contained no giant-cells, but epithelioid and small cells and caseation; no increase of fibrous tissue. No amyloid; tubercle bacilli not found.

Case No. 2252. Admitted 3—31—'04. Died 6—24—'04. Physician, Stanton. Male. White. American. Single. Age, twenty. Occupation, laborer and furniture-packer. Both he and his father had been hard drinkers, and his father had died of phthisis three years before. He had been sick, according to his own account, six weeks, and had been treated in another hospital for typhoid fever. Principal symptoms, slight cough, moderate expectoration of a greenish-yellow color, constipation, night-sweats. His highest weight had been one hundred and sixty pounds; lowest recent weight, one hundred and fifty-five pounds six weeks before admission; weight on admission, not recorded. Heart, diffuse pulsation over whole precordium; second pulmonary accentuated; no murmurs; dulness normal. Liver, extends two finger-breadths below costal margin. Spleen, palpable one and one-half finger-breadths below costal margin. Abdomen, distended. Sputum, tubercle bacilli present. Urine, no albumin, no sugar, diazo present, microscopically, negative. On 5—4—'04, showed slight jaundice, not pronounced, simply an icteroid hue, marked tenderness over liver; bowels, constipated. On 5—14—'04 icteroid hue less well marked. Diagnosis, acute miliary tuberculosis.

Pathological diagnosis: Tuberculosis of lungs with cavity formation; miliary tubercles; edema; pneumonia, and bronchiectasis; parenchymatous nephritis; enlarged mesenteric glands; small ulcer in appendix; adhesive pleurisy; fatty liver. Heart, slightly enlarged; valves normal.

Liver, enlarged; edges rounded. Weight, one thousand eight hundred and sixty grams; consistence, firm; color, dark red; no other abnormalities. Microscopic appearance: Marked grade of congestion with distention of the capillaries; a characteristic miliary tubercle with large giant-cell, epithelioid and round-cells, and caseation; this tubercle is not immediately adjacent to a branch of the vena portæ, but apparently started in an intra-acinal position and extended toward the vein; small round-cells on the side of the tubercle nearest the vein, extending in diminishing numbers clear to the vein and involving its wall; no tubercle bacilli were found; no amyloid reaction present.

Case No. 2046. Admitted 6—7—'04. Died 6—28—'04. Physician, Hatfield. Male. Colored. Age, thirty-one. Widower; wife died of tuberculosis one year ago. Symptoms date five months back. Principal symptoms, cough, expectoration, dyspnea. Highest weight, one hundred and sixty-eight pounds;

lowest, one hundred and forty pounds; weight on admission, one hundred and thirty-eight and one-half pounds. Heart, normal dulness, no murmurs. Spleen, not enlarged. Liver, not enlarged. Sputum, positive for tubercle bacilli. Urine, 1020, no sugar, trace of albumin, diazo slight. Had a large hemorrhage on the day before death. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of right lung with communicating cavities at right apex laying bare the veins; miliary tubercles in lower lobe; miliary tubercles at left apex; congestion and emphysema present in both lungs; enlarged mesenteric glands and parenchymatous nephritis. Heart is slightly hypertrophied; no valvular lesions.

Liver is slightly enlarged, overlaps stomach from right to left; weight, two thousand two hundred and thirty-two grams. Consistence, firm; color, dark red. Gall-bladder contains quite a quantity of brownish fluid. No calculi. Microscopic examination: Moderate congestion; no tubercles; at one point a small collection of small round-cells and a few interspersed epithelioid cells, apparently the beginning of a tubercle. The collection of cells is immediately adjacent to a branch of the portal vein. There is no caseation and there are no giant-cells. No tubercle bacilli were found, and there was no increase of fibrous tissue nor any newly formed bile-ducts.

Case No. 1577. Admitted 10—27—'03. Died 7—11—'04. Physician, McCarthy. Female. Black. Widow. Age, twenty-seven. Occupation, housework. Husband died of phthisis four years before. Previous diseases, pneumonia, malaria seven years before, pertussis, and influenza. Principal symptoms, cough, expectoration, pain and tenderness in chest and in abdomen. Heart, dulness normal; there is a systolic murmur at the apex. Liver, enlarged to the umbilicus, very tender and painful. Large quantity of fluid in the abdomen. Highest weight, one hundred and forty-one pounds; lowest weight before admission, one hundred and five pounds; weight on admission, one hundred and five and three-quarter pounds; weight at death, eighty-eight pounds. Urine, 1018, small quantity of albumin, diazo present; microscopically, granular casts and leucocytes. Sputum, positive for tubercle bacilli. Diagnosis, pulmonary tuberculosis, tuberculous enteritis, peri onitis, appendicitis, pericarditis, fatty liver and hepatoptosis, nephritis, and supernumerary ribs.

Pathological diagnosis, R. C. Rosenberger: Left lung shows cavity formation, tuberculous pneumonia, and miliary tubercles; right lung is studded with miliary tubercles; heart, slightly enlarged, pericardium adherent, valves competent, muscle flabby, paler than normal; kidney, parenchymatous

nephritis, miliary tubercles; spleen, gives amyloid reaction; ulcers in larynx; tuberculous appendicitis; beginning atheroma of the aorta; supernumerary ribs.

Liver is enlarged, extending from the fifth interspace down to the crest of the ilium; weight, three thousand one hundred and twenty-four grams; is of firm consistence, pale yellow in color; gives amyloid reaction; is adherent to right and left sides; on left overlaps the spleen. Microscopic appearance: Moderate congestion; marked amyloid; the amyloid is rather irregularly distributed, but is generally adjacent to the blood-vessels; there are a number of characteristic tubercles containing epithelioid, small round, and giant-cells and caseation; they are all intra-acinal, and have apparently no connection with the branches of the portal vein.

Case No. 2356. Admitted 5—6—'04. Died 8—7—'04. Physician, Walsh. Male. White. American. Single. Age, thirty-four. Occupation, accountant, manager of a pool-room, machinist. Drank to excess. Probably contracted tuberculosis from his brother. Previous diseases, pneumonia three years ago, varioloid, measles, pertussis, scarlatina, diphtheria, and influenza. Has been ill for three years. Principal symptoms, cough, hemoptysis, expectoration, anorexia, night-sweats. Highest weight, one hundred and sixty-two pounds; ordinary, one hundred and forty-seven pounds; lowest, one hundred and seventeen pounds; on admission, one hundred and seventeen pounds. Heart: it is impossible to outline the heart dulness; the aortic second sound is accentuated. Liver, extends three-quarters of an inch below margin of the ribs. Spleen is normal, apparently. Urine, 1028, no albumin, no sugar, diazo positive, microscopically negative. Diagnosis, tuberculosis of lungs, delirium tremens, passive hyperemia of liver, dilated right heart, phlegmasia alba dolens.

Pathological diagnosis, R. C. Rosenberger: Cavity formation in right lung and caseous pneumonia in both lungs; emphysema; parenchymatous nephritis and tubercles in the kidneys; atheroma of the aorta; enlarged mesenteric glands; heart is normal.

Liver, small; weight, one thousand four hundred and eighty-eight grams; firm, pale; cut section presents a mottled appearance; gall-bladder is one finger-breadth below margin of the liver. Microscopic appearance: Fatty change moderate amount, found on the periphery of the lobules; moderate congestion; typical tubercles, periportal in position; no amyloid; slight increase of fibrous tissue; few newly formed bile-ducts.

Case No. 2564. Admitted 7—1—'04. Died 8—6—'04. Physician, Hatfield.

Male. White. Single. Irish. Age, thirty-six. Occupation, freight handler and laborer. Source of contagion, not elicited. Previous disease, pertussis. Principal symptoms, cough, slight expectoration, dyspnea, edema in feet, and constipation. Highest weight, one hundred and forty pounds; lowest recent, one hundred and seven pounds; weight on admission, ninety-three pounds. Heart, enlarged slightly to right and left; both aortic and pulmonic accentuated; soft systolic murmur at apex. Liver, dulness is apparently normal; no tenderness or jaundice or pain. Diagnosis, pulmonary and laryngeal tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Adhesive pleurisy, caseous pneumonia, cavities in both apices, miliary tubercles in both lower lobes, with areas of congestion; heart shows slightly thickened mitral valve, chordæ tendinæ thickened; spleen, normal; kidneys show tubercles; mesenteric glands, enlarged.

Liver, small, weight, one thousand and eighty-five grams, firm, darker than normal; surface slightly granular; edges more or less sharp; red atrophy. Gall-bladder distended, projects below costal margin; duct is patulous. Microscopic appearance: Marked congestion; typical miliary tubercles, with giant-cells; the tubercles are periportal in position.

Case No. 2582. Admitted 7—6—'04. Died 8—17—'04. Physician, McCarthy. Male. Black. Single. Native. Age, six. No occupation. Source of contagion, maternal aunt. Previous diseases, measles, five months before. Duration of illness, five months. Principal symptoms, cough, expectoration, dyspnea, constipation, night-sweats. Lowest weight, thirty pounds; highest and ordinary weight, not recorded. Evidence of rachitis in legs and abdomen. Heart, dulness normal; pulmonary second accentuated; no murmurs. Liver, enlarged half-way to umbilicus and is tender. Spleen, enlarged and palpable. Sputum, tubercle bacilli present. Urine, 1030, yellow, trace of albumin, granular casts. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, Joseph Walsh: Tuberculosis of lungs with cavities; miliary tubercles are thickly studded throughout; adhesive pleurisy on both sides; tuberculosis of bronchial, tracheal, and mesenteric lymph-nodes; tubercle in pericardial sac posteriorly; extensive tuberculosis of peritoneum; tuberculosis of spleen and kidneys; heart, apparently normal.

Liver, does not appear enlarged; weight, nine hundred and thirty grams; consistence, normal; color, pale; slightly fatty; contains numerous tubercles. Microscopic appearance: Typical tubercles with giant-cells and a great increase in the number of bile-ducts; the tubercles are periportal in position

and are rather diffuse, there being several giant-cells in the neighborhood of the branches of the portal vein; no congestion. There is no amyloid; tubercle bacilli were found.

Case No. 2668. Admitted 8—9—'04. Died 8—22—'04. Physician, Norris. Female. Black. Married. Age, twenty-eight. Occupation, house-servant. Source of contagion, not elicited. Previous diseases, typhoid fever in 1881. Has been ill for fifteen months. First symptom, glandular enlargement. Symptoms, cough, expectoration, dyspnea, hoarseness, night-sweats, amenorrhea. Highest weight, one hundred and twenty pounds; weight on admission, not recorded. Heart, dulness extends to midclavicular line; pulmonary sound not accentuated; no murmurs. Liver is not enlarged; no tenderness, pain, or jaundice. Spleen is not enlarged. Sputum, positive for tubercle bacilli. Urine, 1020, acid, trace of albumin, no sugar, diazo positive. Diagnosis, pulmonary tuberculosis; lymphatic and laryngeal tuberculosis; and tuberculosis of the pharyngeal tonsil.

Pathological diagnosis, Joseph Walsh: Miliary tuberculosis of lungs, spleen, kidneys, liver, and suprarenals; ulceration of the intestine; tuberculous peritonitis; tuberculosis of the bronchial, cervical, and mesenteric lymph-glands; parenchymatous nephritis; endometritis and oöphoritis.

Liver, normal size, one thousand eight hundred and sixty-five grams; consistence, normal; color, dark; riddled with miliary tubercles; one calcified tubercle. Microscopic diagnosis: Section is studded with miliary tubercles; some of the tubercles have giant-cells, but most lack them; the tubercles are marked by caseation and there is evidence of calcification in some of them; most of the tubercles are intra-acinal in position, but some are periportal; congestion is moderate; tubercle bacilli are present in large numbers; no amyloid reaction present.

Case No. 282. Admitted 3—18—'04. Died 8—24—'04. Physician, Walsh. Male. White. Married. Irish. Age, forty-five. Occupation, laborer. Source of infection, wife. Previous diseases, typhoid, pleurisy, scarlatina. Duration of illness, five years. Principal symptoms, cough, expectoration, dyspnea, diarrhea, edema of feet. Highest weight, one hundred and fifty-nine pounds; lowest weight (recent), one hundred and thirty pounds; weight on admission, one hundred and twenty-three pounds. Liver, normal apparently. Spleen, normal apparently. Sputum, positive for tubercle bacilli. Urine, trace of albumin, granular and hyaline casts; some epithelial cells. Diagnosis, pulmonary tuberculosis with cavity formation; serous effusion on right; myocarditis and dilated right heart; arteriosclerosis.

Pathological diagnosis, Walsh: Tuberculosis of lungs; fibroid condition of both lungs, the right compressed by a pyothorax, the left by a recent pneumothorax; cavities in both apices; obliterative pericarditis; parenchymatous nephritis.

Liver, enlarged; weight, two thousand nine hundred and seventy-six grams; consistence, normal; color, pale; tubercles under capsule. Microscopic appearance: Shows no tubercles; moderate congestion; no amyloid; no increase of fibrous tissue; no tubercle bacilli; no increase of bile-ducts.

Case No. 2576. Admitted 7—5—'04. Died 9—1—'04. Physician, Walsh. Male. White. Native. Single. Age, twenty-one years. Occupation, clerk. Non-alcoholic. Source of contagion, not elicited. Previous diseases, typhoid fever, fistulo in ano. Duration of illness, seven years. Principal symptoms, cough, expectoration, dyspnea, chills. Highest weight, one hundred and forty pounds; lowest recent, ninety-five pounds; weight on admission, seventy-four and three-quarter pounds. Heart, slightly enlarged to right and left; slight arteriosclerosis. Liver, normal size; spleen and kidneys, normal. Tenderness over appendix. Sputum, positive for tubercle bacilli. Urine, 1030, no albumin, no sugar, diazo positive. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Cavities in upper lobes; heart, normal; spleen, normal; congestion of kidneys; congestion of liver; enlarged mesenteric glands; tuberculosis of appendix.

Liver, weight, one thousand three hundred and sixty-seven grams; firm consistence; normal color; gall-bladder small and contains a small amount of bile; the duct is patulous. Microscopic diagnosis: Moderate congestion; no tubercle; no amyloid; no increase in bile-ducts; no increase in fibrous tissue.

Case No. 2102. Admitted 9—5—'04. Died 9—9—'04. Physician, McCarthy. Male. White. Single. Native. Age, eighteen. Occupation, bookkeeper. No history of alcoholism. No known source of infection. No previous diseases. Has been ill for fifteen months. First symptom, malaise. Principal symptoms, cough, expectoration, dyspnea on exertion, hoarseness. Highest weight, one hundred and thirty-four pounds; lowest recent, one hundred and twenty-five and three-quarter pounds; weight on admission, not recorded. Heart, apparently normal. Spleen, thyroid, and kidney apparently normal. Liver, not enlarged. Sputum, positive for tubercle bacilli. Urine, 1022, albumin, diazo positive. Diagnosis, pulmonary and laryngeal tuberculosis; hemorrhagic purpura.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs

with cavity formation and miliary tubercles and emphysema; amyloid spleen; enlarged calcareous mesenteric glands; tuberculous enteritis and appendicitis; laryngeal tuberculosis. Heart, normal.

Liver, amyloid, large, weighs two thousand five hundred and seventy-three grams; firm consistence; normal color; rounded edges. Microscopic appearance: Markedly amyloid; very slight congestion; one atypical tubercle containing round and epithelioid, but no giant-cells; the tubercle is periportal in position; no tubercle bacilli found; no newly formed bile-ducts and no increase of fibrous tissue.

Case No. 501. Admitted 9—2—'04. Died 9—10—'04. Physician, Walsh. Male. White. Native. Widower. Age, fifty-three. Occupation, weaver, fireman, miner. Alcoholic. No known exposure to contagion. Previous diseases, typhoid fever, malaria, rheumatism, pleurisy, measles, diphtheria, and influenza. Duration of illness, four years. Principal symptoms, cough, expectoration, hemoptysis, pain in chest, constipation. Highest weight, not known; weight at first visit, one hundred and thirty-seven pounds; weight on admission, seventy pounds. Heart, not enlarged, sounds weak. Liver, normal apparently. Sputum, positive for tubercle bacilli. Urine, 1026, acid, trace of albumin, no sugar, diazo positive, hyaline and granular casts, uric-acid crystals. Diagnosis, pulmonary tuberculosis, emphysema, anthracosis, and arteriosclerosis.

Pathological diagnosis, R. C. Rosenberger: Anthracosis of both lungs; cavities in both lungs and miliary tubercles; fatty liver; interstitial nephritis; mitral endocarditis; pigmentary infiltration of spleen.

Liver, slightly enlarged, weight, one thousand four hundred and eighty-eight grams; firm and mottled. Microscopic appearance: Moderate congestion; fatty change moderate at the periphery of the lobules; typical miliary tubercles containing giant-cells, intra-acinal in position; one seems to be periportal in position; there are a few newly formed bile-ducts; no increase in fibrous tissue; no amyloid.

Case No. 2689. Admitted 9—2—'04. Died 9—16—'04. Physician, Stanton. Male. White. Single. Native. Age, thirty-three. Occupation, wood-worker. Contagion from brother and sister. Previous diseases, typhoid fever, malaria, and influenza. Duration of illness, two years. Principal symptoms, cough, expectoration, dyspnea. Highest weight, one hundred and thirty-eight pounds; lowest recent, one hundred and seventeen pounds; weight on admission, one hundred and fourteen and three-quarter pounds. Heart, normal in dulness and sounds. Liver, not felt. Sputum, positive for

tubercle bacilli. Urine, albumin present, no sugar, diazo positive; microscopically, a few granular casts. Diagnosis, pulmonary tuberculosis, right-sided pneumothorax, parietic mental type.

Pathological diagnosis, R. C. Rosenberger: Right-sided pneumothorax; tuberculous pneumonia and cavity formation in right lung; edema and congestion of left lung; fatty liver and peritoneal adhesions; pleural adhesions; parenchymatous nephritis; spleen, large; heart, normal.

Liver, enlarged, weighs two thousand four hundred and eighty grams; consistence, fatty; no calculi in gall-bladder; gall-bladder small and empty. Microscopic appearance: No tubercles found; moderate amount of congestion; moderate grade of fatty change found on the periphery of the lobules; no amyloid; no increase of fibrous tissue; no newly formed bile-ducts.

Case No. 1032. Admitted 8-9-'04. Died 9-10-'04. Physician, Walsh. Male. White. Single. Native. Age, twenty-seven years. Occupation, coppersmith. Alcoholic. Source of contagion, not elicited. Previous disease, measles. Duration of disease, two years. Principal symptoms, cough, expectoration, pain in chest, dyspnea on exertion, anorexia, occasional chills, frequent night-sweats, diarrhea, and edema. Highest weight, one hundred and forty-five pounds; ordinary, one hundred and thirty-five pounds; lowest recent, one hundred and twenty-five pounds; on admission, one hundred and fifteen pounds. Heart, not charted. Liver, spleen, and kidneys not recorded. Sputum, positive for tubercle bacilli. Urine, no albumin, no sugar, no casts. Diagnosis, pulmonary tuberculosis; tuberculosis of the pleura and intestines.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of the lungs with cavity formation; adhesive pleurisy; fatty kidneys; amyloid spleen.

Liver, small; weight, one thousand one hundred and seventy-eight grams; congested; mottled in appearance; consistence, firm; color, dark red. Microscopic appearance: Typical miliary tubercles with giant-cells; the tubercles are, for the most part, intra-acinal, but one is periportal; moderate congestion; moderate fatty changes seen at the periphery of the lobules; there is a beginning fibrous capsule to a tubercle; no amyloid; no tubercle bacilli; no increase of bile-ducts.

Case No. 2538. Admitted 6-22-'04. Died 9-24-'04. Physician, Landis. Female. White. Married. Native. Age, thirty-seven. Mother of four children. Occupation, housework. House probably source of infection. Previous diseases, typhoid fever twelve years ago. Duration of disease, fourteen months. Principal symptoms, cough, expectoration,

dyspnea on exertion, occasional chills, amenorrhea. Highest weight, one hundred and sixty pounds; ordinary, one hundred and ten pounds; weight on admission, seventy-nine and one-half pounds. Heart, enlarged to left, no murmurs, no accentuation of pulmonic or aortic sounds. Liver, enlarged, is two finger-breadths below the costal margin. Spleen, apparently normal. Thyroid, left lateral lobe enlarged. Kidney, not palpable. Sputum, positive for tubercle bacilli. Urine, 1025, no albumin, no sugar, diazo positive. Diagnosis, tuberculosis of lungs and pharynx.

Pathological diagnosis, R. C. Rosenberger: Lungs contain small cavities and miliary tubercles; congestion of kidneys; cyst of Fallopiian tube; tuberculosis of larynx; spleen, slightly enlarged; heart shows fatty infiltration.

Liver, enlarged to level of the umbilicus; weight, one thousand six hundred and twenty grams; normal consistence; normal color; negative for amyloid. Microscopic appearance: Typical tubercles containing giant-cells, periportal in position; numerous areas consisting of a collection of small round-cells are found in the periportal spaces; these areas are not sharply defined, are rather diffuse, and contain newly formed bile-ducts; moderate congestion; no amyloid; no tubercle bacilli found.

Case No. 2657. Admitted 8—5—'04. Died 9—20—'04. Physician, Stanton. Male. White. Single. Italian. Age, sixteen. Occupation, gilder. Non-alcoholic. Source of contagion, not elicited. Had influenza in February, 1904. Has been ill for one year. Principal symptoms, cough, expectoration, dyspnea, diarrhea, chills, and sweats. Highest weight, one hundred and twenty pounds; lowest, one hundred pounds; weight on admission, eighty-seven pounds. Liver, spleen, and kidney apparently normal. Heart, apparently normal in dulness and sounds. Four days before death had a petechial eruption on chest and abdomen and a persistent epistaxis and hemorrhage from the bowels. Diagnosis, pulmonary tuberculosis and purpura hæmorrhagica.

Pathological diagnosis, R. C. Rosenberger: Cavities in both lungs and miliary tubercles; pleural adhesions; parenchymatous nephritis; tuberculous enteritis; enterorrhagia; accessory spleen; petechiæ upon skin and in pericardium and pleura; enlarged mesenteric glands.

Liver, small; weight, one thousand two hundred and seventy-one grams; consistence, firm; color, pale; left lobe is thin, tapering, and adherent; edges, rounded. A few small areas resembling miliary tubercles. Microscopic appearance: Slight congestion; typical tubercles containing giant-cells; the tubercles are intra-acinal in position; one tubercle is very close to a large branch of the portal vein, but is not in communication apparently; no amyloid;

no increase of fibrous tissue; no newly formed bile-ducts; tubercle bacilli found.

Case No. 714. Admitted 5—25—'04. Died 9—27—'04. Physician, Walsh. Male. White. Single. Native. Age, twenty-seven. Occupation, machine operator. Source of infection, unknown. Previous disease, measles. Duration of illness, fifteen months. Principal symptoms, cough, expectoration, dyspnea on exertion, night-sweats. Highest weight, one hundred and forty-five pounds; ordinary, one hundred and forty pounds; lowest, one hundred and twenty-five pounds; weight on admission, one hundred and eleven pounds. Heart, normal in size and position, no arteriosclerosis, second aortic accentuated. Liver, spleen, and kidney not recorded. Sputum, positive for tubercle bacilli. Urine, 1026, no albumin, no sugar, diazo negative; microscopically, negative. Diagnosis, tuberculosis of the lungs with cavity formation, pneumothorax.

Pathological diagnosis, R. C. Rosenberger: Pyopneumothorax; emphysema of right lung, miliary tubercles, and edema; parenchymatous nephritis and tubercles in the kidney; amyloid spleen; congestion of the liver; heart, normal.

Liver, weight, one thousand four hundred and twenty-six grams; consistence, firmer than normal; color, darker than normal; gall-bladder contains 10 c.c. of fluid. Microscopic appearance: Marked degree of congestion, with distention of the capillaries and compression of the liver-cells; slight amount of amyloid; typical tubercles with giant-cells, intra-acinal in position; no increase in bile-ducts; tubercle bacilli found.

Case No. 232. Admitted 9—22—'04. Died 9—28—'04. Physician, Stanton. Male. White. Foreign-born (Newfoundland). Married. Age, twenty-eight years. Occupation, not recorded. Two children died of meningitis. Probable source of contagion, mother and wife's mother. Previous diseases, measles and influenza. Duration of illness, two and one-half years. Principal symptoms, cough, hemoptysis, pain, expectoration, dyspnea, hoarseness, night-sweats. Weight, condition of heart, liver, spleen, and kidneys not recorded. Sputum, positive for tubercle bacilli. Urine, 1020, acid, no albumin, no sugar, a few hyaline and granular casts microscopically. Died of hemorrhage. Diagnosis, pulmonary tuberculosis and laryngeal tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Cavities in both lungs and emphysema; adhesive pleurisy; fatty liver; congested kidney; heart, normal; spleen, enlarged.

Liver, large; capsule upon right side is adherent to under surface of

diaphragm; weight, one thousand six hundred and seventy-six grams; color, dark red, paler than normal; no visible tubercles. Microscopic appearance: Moderate congestion with compression of liver-cells and distention of the capillaries; typical miliary tubercles with giant-cells, intra-acinal in position; no increase in bile-ducts; no increase in fibrous tissue; no amyloid.

Case No. 236. Admitted 9—1—'04. Died 10—2—'04. Physician, Walsh. Male. White. Single. Native. Age, thirty-two. Occupation, not stated. Source of contagion, probably mother. Duration of illness, eight years. Principal symptoms, cough, expectoration, constipation, hemoptysis, pain in abdomen. Highest weight, one hundred and forty pounds; lowest, one hundred and twenty-five pounds; weight on admission, one hundred and twenty-four pounds. Heart, dulness smaller than normal; pulmonic second markedly accentuated. Liver, not enlarged. Spleen, enlarged. Kidney, not recorded. Urine shows trace of albumin. Sputum, positive for tubercle bacilli. Diagnosis, pulmonary tuberculosis, tuberculous cystitis, tuberculosis of kidney.

Pathological diagnosis, R. C. Rosenberger: Fibroid tuberculosis of right lung; tuberculosis of left lung with cavity formation; pleurisy of both; chronic parenchymatous nephritis of right kidney; ulcerative tuberculosis of left; cystitis; amyloid spleen; congestion and calcified tubercle of liver; heart, normal.

Liver, about normal; weight, one thousand eight hundred and twenty-nine grams; consistence, firm; color, normal; no amyloid; shows calcified tubercle $\frac{1}{2}$ cm. in diameter. Microscopic appearance: Moderate congestion; typical miliary tubercles, periportal in position; slight amyloid; no increase in fibrous tissue; no newly formed bile-ducts.

Case No. 2662. Admitted 8—8—'04. Died 10—7—'04. Physician, Landis. Female. White. Married. Age, forty. Occupation, tattooed woman in a circus for eight years; last twenty years, housework. Markedly alcoholic at one time. Probably infected from her father. Has had scarlatina and diphtheria as a child. Denied syphilis. Sick, six months. Symptoms, cough, expectoration, dyspnea on exertion, epigastric pain after eating, bowels constipated, slight edema. Highest weight, one hundred and sixty-five pounds; lowest, one hundred and twenty-two pounds; weight on admission, one hundred and four pounds. Liver, spleen, and thyroid not enlarged at first examination. Tubercle bacilli present. Urine, 1022, trace of albumin, no sugar, no casts. Heart, not recorded. On 8—25—'04 it is noted that patient gives a history of excess in alcohol over a long period, and that liver is enlarged and

edge is hard, but smooth, and is not tender; on 9-16-'04 patient complains of marked epigastric pain, more marked after taking food; on 9-24-'04 patient is markedly jaundiced; liver is slightly enlarged; pressure in epigastric region causes a great deal of pain; no mass is found; no bile in the urine. On 9-26-'04 blood examined: 3,840,000 red blood-corpuscles, 10,000 white blood-corpuscles; blood pale and coagulated with difficulty; jaundice very marked; conjunctiva a bright yellow; liver is distinctly palpable; edge is sharp and feels hard; enlargement apparent in left lobe. On 10-5-'04 urine gave a distinct reaction for bile; jaundice is intense; there is a trace of albumin, but no casts; extreme tenderness in epigastric region. On 10-7-'04, day of death: jaundice still extreme; pain in epigastrium intense; pulse weak and irregular; stools resemble putty; for past two or three days has had five to eight movements daily. In view of intense jaundice there was diagnosed some obstruction within or without the common duct, and, as no tumor could be felt in the pancreatic region, it was thought the trouble was in the duct.

Pathological diagnosis, R. C. Rosenberger: Left lung shows small cavities and tuberculous pneumonia; right lung shows few caseous nodules; heart shows fatty infiltration of muscle; spleen is large and shows small yellowish-white nodules scattered through it; kidneys are fatty and contain tubercles; miliary tuberculosis of spleen and liver.

Liver, enlarged; weight, two thousand and sixteen grams; dense and granular on surface; edges are rounded; its color is pale; scattered throughout are numerous small yellowish-white areas of firm consistence—some few are coalesced; the bile-duct is patulous; the gall-bladder is distended with fluid, glycerin-like in consistence. Microscopic appearance: Many caseous areas, containing no giant-cells and surrounded by epithelioid and small round-cells—apparently the so-called solitary tubercle of the liver; there are also typical miliary tubercles containing giant-cells; the caseous nodules correspond to the yellowish-white nodules seen macroscopically, and they contain tubercle bacilli in their periphery; there is an increase in the amount of fibrous tissue; there is apparently no amyloid; no congestion.

Case No. 2701. Admitted 9-12-'04. Died 10-9-'04. Physician, Hatfield. Male. Black. Native. Single. Age, twenty-two. Occupation, waiter and huckster. Exposure to contagion from a friend. Measles in childhood. Had been sick one year. Symptoms, cough, expectoration, dyspnea, gastric disturbances, diarrhea, night-sweats. Highest weight, one hundred and forty-five pounds; lowest weight, one hundred and twelve pounds; weight on admission, one hundred and seventeen pounds. Liver, markedly tender. Spleen, thyroid, and kidney apparently normal. Heart,

slightly increased to right and to left. Sputum, positive for tubercle bacilli. Urine, albumin a trace, otherwise negative. Diagnosis, tuberculosis of lungs, larynx, intestines.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of lung with cavity formation; tuberculous pneumonia; pleurisy; parenchymatous nephritis; mitral endocarditis; tuberculous appendicitis and peritonitis.

Liver, normal size; weight, one thousand three hundred and two grams; firmer and darker than normal; gall-bladder contains 20 c.c. clear fluid, light yellow in color. Microscopic appearance: Moderate grade of congestion; no typical miliary tubercles with giant-cells found; few collections of round and epithelioid cells with caseation found; no amyloid; no increase in fibrous tissue and no newly formed bile-ducts; tubercle bacilli not found.

Case No. 2446. Admitted 7-13-'04. Died 10-16-'04. Physician, McCarthy. Female. Black. Native. Single. Age, seventeen years. Occupation, housework. Source of contagion, not elicited. Previous diseases, influenza, measles, pertussis. Duration of illness, two years. Principal symptoms, cough, expectoration, dyspnea on exertion, hoarseness, chills, and night-sweats. Highest weight, one hundred and ten pounds; ordinary weight, one hundred and six pounds; lowest weight, ninety-eight pounds; on admission, eighty-two pounds. Liver, normal in size, tender to touch. Spleen, thyroid, and kidney apparently normal. Heart, dulness normal; pulmonary second accentuated. Sputum, positive for tubercle bacilli. Urine, 1030, trace of albumin; microscopically, hyaline and granular casts. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, Joseph Walsh: Cavities in both lungs and caseous pneumonia in left base; pleurisy of both sides; fatty infiltration of liver; enlarged mesenteric glands; probably ulcers of the appendix. Heart, normal.

Liver, normal size; weight, one thousand two hundred and nine grams; consistence, firm; color, paler than normal; contains several pale areas, evidently of a fatty nature; gall-bladder small, contains a small quantity of dark, fluid bile. Microscopic appearance: Moderate grade of congestion; a few typical miliary tubercles containing giant-cells; no increase of fibrous tissue; no newly formed bile-ducts; no tubercle bacilli, and no amyloid.

Case No. 2602. Admitted 7-12-'04. Died 11-1-'04. Physician, Norris. Female. White. Single. Native. Age, twenty-eight. Occupation, housework. Source of contagion, mother. Previous diseases, measles, pertussis, scarlatina. Has been ill for one year. Principal symptoms, cough, expectoration, pain in abdomen, dyspnea, hoarseness, anorexia, constipation,

chills, sweats, and edema. Highest weight, one hundred and five pounds, one year before admission; ordinary weight, one hundred pounds; lowest weight, eighty-three pounds; weight on admission, eighty-three pounds. Liver, spleen, thyroid, and kidney are not enlarged. Heart is slightly enlarged to left, shows a hemic systolic murmur at base; tubercle bacilli in sputum. Urine, turbid, 1020, acid, no albumin, no sugar. Some tenderness in epigastrium and diarrhea two months before death. On 8—18—'04 liver was slightly enlarged. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Ulcerative tuberculosis of both lungs; emphysema and bronchiectasis, with miliary tuberculosis of right lung; amyloid spleen; tuberculous enteritis; parenchymatous nephritis; congestion of liver; atheroma of aorta; heart slightly enlarged.

Liver, normal size; dark in color; weight, one thousand three hundred and thirty-three grams; firm consistence; few small areas in left lobe which are either coagulative necrosis or fatty infiltration; gall-bladder distended and contains dark, tarry fluid. Microscopic appearance: Mild grade of congestion; one typical miliary tubercle with giant-cell near branch of portal vein, yet not in the portal spaces; no amyloid; no increase in fibrous tissue; no newly formed bile-ducts.

Case No. 2180. Admitted 3—31—'04. Readmitted 7—16—'04. Died 10—27—'04. Physician, Landis. Female. White. German. Married. Age, forty-two. Nine children and two miscarriages. Occupation, housework. Probable source of contagion, mother. Previous disease, rheumatism, sixteen years before. Principal symptoms, cough, expectoration, pain in chest, hoarseness, vomiting, chills, and night-sweats. Lowest weight before admission, one hundred and two pounds; weight on admission, one hundred pounds. Heart, dulness normal; a systolic murmur at the apex; pulmonary second accentuated and a systolic murmur at pulmonary cartilage. Liver, increased midway to umbilicus and very tender. Spleen and kidney, apparently normal. Sputum, positive for tubercle bacilli. Urine, amber, acid, 1024, albumin a trace, no sugar, no casts or pus-cells, diazo positive. Diagnosis, pulmonary tuberculosis; mitral regurgitation.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of lungs with cavities in both lungs; caseous pneumonia in right lung; pleurisy of both sides; congestion of liver; mitral valvulitis; parenchymatous nephritis; atheroma of aorta and splenic artery; capsulitis of spleen and liver; appendicitis; pericarditis.

Liver, slightly enlarged; normal color and consistence; weight, one thousand nine hundred and twenty-six grams; veins sharply dilated; more or less

mottled on section; gall-bladder extends below margin of liver and contains yellowish, tenacious bile. Microscopic appearance: Moderate congestion; one typical miliary tubercle, periportal in position; marked amount of fatty change found on periphery of the lobules; no amyloid; no increase of fibrous tissue; no newly formed bile-ducts.

Case No. 2494. Admitted 6—10—'04. Died 11—1—'04. Physician, Hatfield. Male. White. Single. Irish. Age, twenty-three. Occupation, hospital porter. Moderate drinker. No source of contagion elicited. Previous diseases, typhoid (?) six months before; rheumatism (?) four months before; measles; influenza (?) three years before. Has been sick three years. Symptoms, cough, expectoration, dyspnea on exertion, diarrhea, occasional chills, night-sweats, edema of the feet. Highest weight, one hundred and twenty-two and one-half pounds; ordinary weight, one hundred and twenty pounds; lowest weight, one hundred and five pounds; weight on admission, one hundred and one-half pounds. Liver and spleen apparently normal. Heart, dulness increased to right and left; second sounds accentuated; no murmurs. Sputum, positive for tubercle bacilli. Urine, alkaline, 1022, no sugar, trace of albumin, slight diazo. Diagnosis, tuberculosis of intestines, lungs, and surgical kidney.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs; cavities and miliary tubercles; adherent pleurisy; tuberculosis of intestines and appendix, of right kidney, ureter, and bladder; cloudy swelling of right kidney; enlarged mesenteric and bronchial glands; small cyst of prepuce.

Liver, enlarged, pale, firm; weight, one thousand seven hundred and five grams; edges rounded; gall-bladder distended, extending below margin of ribs; upon section, organ is pale and mottled. Microscopic appearance: Marked grade of fatty change found at periphery of the lobules; atypical miliary tubercles without giant-cells; newly formed bile-ducts; no increase in fibrous tissue; slight amount of congestion.

Case No. 2815. Admitted 10—18—'04. Died 11—9—'04. Physician, McCarthy. Female. White. Native. Married. Age, twenty-eight. Has had two children. Occupation, housework. Source of infection, mother. Previous diseases, malaria, four years ago, pneumonia as a baby, measles in childhood. Duration of illness, nine months. Principal symptoms, cough, expectoration, dyspnea on exertion, diarrhea, amenorrhea. Highest weight, one hundred pounds; ordinary weight, one hundred pounds; lowest weight, ninety-five pounds; weight on admission, not recorded. Heart, normal in size; both pulmonic and aortic second accentuated. Liver, not enlarged.

Spleen, not enlarged. Thyroid, enlarged on the right side. Kidney, not palpable. Sputum, positive for tubercle bacilli. Urine, not examined. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs with cavity formation; coalesced tubercles in both lungs; caseous pneumonia and emphysema of right lung; adhesive pleurisy; red atrophy of liver; dilatation of right side of heart; displacement of uterus to right; enlarged mesenteric and bronchial glands.

Liver, enlarged; extending 3 cm. above the umbilicus; is darker than normal; weight, two thousand one hundred and eight grams; distention of veins; on inferior surface of right lobe there are small pale areas which extend in the liver substance a short distance, but are mostly superficial. Gall-bladder is distended. Microscopic appearance: Marked grade of congestion with distention of capillaries and compression of liver-cells; typical miliary tubercles, intra-acinal in position; no amyloid; no newly formed bile-ducts; no increase of fibrous tissue.

Case No. 2596. Admitted 7-11-'04. Died 11-8-'04. Physician, McCarthy. Male. White. Divorced. Native. Age, forty-two. Occupation, weaver for twelve years; driver. Moderate drinker. Source of infection, possibly stepfather. Previous diseases, typhoid fourteen years ago; rheumatism three years ago; measles and pertussis in childhood. Has been ill two years. Principal symptoms, cough, expectoration, dyspnea on exertion, hoarseness, chills, night-sweats, edema. Highest weight, one hundred and eighty pounds; ordinary weight, one hundred and sixty-eight pounds; lowest weight, one hundred and fifty pounds; weight on admission, one hundred and twenty-four and one-half pounds. Liver, normal in size; has a sharp edge. Spleen, thyroid, and kidney are normal. Heart is normal. Sputum, positive for tubercle bacilli. Urine, 1010, alkaline, no albumin, no sugar, diazo positive. Diagnosis, pulmonary tuberculosis; neuritis.

Pathological diagnosis, R. C. Rosenberger: Adhesive pleurisy on both sides; emphysema with miliary tubercles in left lung; cavity formation and caseous pneumonia of right lung; congestion of kidney; congestion of liver with apparently calcified tubercles; enlarged mesenteric and bronchial glands; cystitis; atheroma of tibial and femoral arteries; heart, apparently normal; larynx shows ulcers.

Liver, normal in size; weight, one thousand four hundred and eighty-eight grams; firm and dark; shows congestion and dilatation of blood-vessels; on right lobe are several yellowish, firm nodules, which are calcareous. Microscopic appearance: Marked grade of fatty change on the periphery of the

lobules; moderate amount of congestion; atypical miliary tubercles, both intra-acinal and periportal; no increase in fibrous tissue; no newly formed bile-ducts; no amyloid.

Case No. 2787. Admitted 10-11-'04. Died 11-17-'04. Physician, Landis. Female. White. Married. Native. Age, thirty-five. Had four children. Occupation, dressmaker and housework. Source of contagion, brother. Previous diseases, measles and pertussis in childhood. Duration of illness, two years. Principal symptoms, cough, pain in chest, expectoration, dyspnea on exertion, chills, night-sweats, and edema of ankles. Highest weight, one hundred and twenty-four pounds; ordinary weight, one hundred and twelve pounds; weight on admission, not recorded. Heart, apparently normal; pulmonary second accentuated. Liver, enlarged two finger-breadths below costal margin. Spleen and kidneys, not enlarged. Thyroid, enlarged. Sputum, positive for tubercle bacilli. Urine, yellow, acid, no albumin, no sugar, diazo positive. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of lungs with cavity formation in both apices; miliary tubercles and emphysema; congestion of liver and kidneys; enlarged thyroid; enlarged mesenteric glands; enlarged bronchial glands; edema of brain; cysts of ovaries; ulcers in caput coli.

Liver, slightly enlarged, dark red; normal; weight, one thousand four hundred and eighty-eight grams; is displaced downward; gall-bladder projects below margin. Microscopic appearance: Moderate congestion; one atypical tubercle lacking the giant-cell; it is intra-acinal in position; no fatty change; no newly formed bile-ducts; no increase in fibrous tissue; no amyloid.

Case No. 2899. Admitted 11-15-'04. Died 11-22-'04. Physician, Walsh. Male. White. Married. Polander. Age, twenty-six. Occupation, laborer in a morocco factory. Source of contagion, not elicited. No history of previous diseases. Has been ill five years. Principal symptoms, cough, hemoptysis, expectoration, pain in side, dyspnea on exertion, hoarseness, chills, night-sweats, edema of feet. Highest weight, one hundred and seventy-five pounds; ordinary weight, one hundred and sixty pounds; lowest recent weight, one hundred and twenty-five pounds; weight on admission, not obtained. Liver dulness lessened by tympany of abdomen and emphysema of lungs. Spleen and thyroid, normal. Kidney, not palpable. Heart, apparently normal. Sputum, positive for tubercle bacilli. Urine, 1024, no albumin, no sugar, hyaline casts, and a few pus-cells. Diagnosis, tuberculosis of lungs; acute tuberculous pneumonia.

Pathological diagnosis, R. C. Rosenberger: Ulcerative and miliary tuber-

culosis of both lungs; gangrene of right lung; edema and emphysema of both lungs; miliary tubercles in liver; tubercles in kidney; appendicitis; enlarged mesenteric and bronchial glands; pleurisy; tuberculosis of right adrenal; heart, middle aortic cusp shows fenestration.

Liver, enlarged, two thousand two hundred and eight grams; dark; firm; veins prominent; the whole substance shows numerous small whitish areas—some scattered, others coalesced. Microscopic appearance: Marked congestion and compression of liver-cells; miliary tubercles (atypical) containing small round and epithelioid cells and caseation, but no giant-cells; there is apparently some increase of fibrous tissue, the fibrous tissue extending from about the portal veins in between the hepatic cells; this shows well with the van Giesen stain; no tubercle bacilli; no amyloid.

Case No. 2796. Admitted 10-13-'04. Died 11-25-'04. Physician, Hatfield. Male. White. Single. Native. Age, eighteen. Occupation, clerk. No source of contagion elicited. Previous diseases, measles and scarlet fever in childhood. Duration of illness, one year. Principal symptoms, cough, expectoration, dyspnea on exertion, hoarseness, and diarrhea. Highest weight, one hundred and twenty-eight pounds; lowest weight, one hundred and seventeen pounds; weight on admission, one hundred and six and one-quarter pounds. Heart, dulness normal in size; both aortic and pulmonic second markedly accentuated. Liver, not enlarged. Splenic dulness slightly increased. Thyroid and kidneys, normal. Sputum, positive for tubercle bacilli. Urine, 1022, no albumin, no sugar, diazo positive. Diagnosis, miliary tuberculosis of the lung; tuberculous peritonitis and enteritis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs with cavity formation; edema; congestion and caseous pneumonia; pleurisy; valvulitis of mitral and aortic valves; fatty liver; fatty kidneys with congestion; enlarged mesenteric and bronchial glands; tuberculous ulcers of ileum.

Liver, normal in size; weight, one thousand eight hundred and twenty grams; edges rounded; pale and firm; no visible tubercles. Microscopic appearance: Typical miliary tubercles containing giant-cells; the tubercles are periportal in position; there are many newly formed bile-ducts; around one branch of the portal vein are many newly formed bile-ducts and a collection of small round-cells and epithelioid cells without a giant-cell; no increase in fibrous tissue; no tubercle bacilli found; no amyloid; slight congestion.

Case No. 2821. Admitted 10-20-'04. Died 11-27-'04. Physician, McCarthy. Male. White. Swedish. Single. Age, thirty-four. Occupation, waiter. Source of contagion, not elicited. Previous disease, measles.

Duration of illness, five months. Principal symptoms, cough, expectoration, dyspnea, night-sweats. Highest weight, one hundred and seventy-five pounds; ordinary weight, one hundred and seventy-five pounds; lowest recent weight, one hundred and fifty-five pounds; weight on admission, one hundred and thirty-six pounds. Liver, enlarged midway to umbilicus, but not tender. Spleen, enlarged, palpable on deep inspiration. Thyroid and kidneys, normal. Heart, normal apparently. Sputum, positive for tubercle bacilli. Urine, 1024, no albumin, no sugar, diazo positive. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Ulcerative tuberculosis of left lung with scattered miliary tubercles; miliary tuberculosis; emphysema; atelectasis of right lung; pleurisy with effusion; appendiceal ulcer; congestion of kidneys; fatty (?) liver; enlarged bronchial glands; heart dilated, especially on right side.

Liver, enlarged, two thousand one hundred and sixty-six grams, and on section presents a few small nodules, presumably tubercles; consistence firm; no amyloid reaction; gall-bladder distended and contains brown, tenacious bile; no calculi. Microscopic appearance: Marked grade of congestion with atrophy of some of the liver-cells and hypertrophy of others; one large tubercle is found in a periportal position; it consists of epithelioid and small round-cells and caseous material; one giant-cell is found; no increase of fibrous tissue; no newly formed bile-ducts.

Case No. 2716. Admitted 9—7—'04. Died 11—30—'04. Physician, McCarthy. Female. White. Widow. Foreign. German. Age, thirty-eight. Had one child. Occupation, ran a steam press. Not alcoholic. Source of contagion, probably brother. Previous diseases, typhoid, smallpox, and measles. Duration of illness, six months. Principal symptoms, cough, expectoration, dyspnea on exertion, constipation, and night-sweats. Highest weight, one hundred and forty-six pounds; lowest recent weight, ninety-eight pounds; weight on admission, ninety-two and one-half pounds. Heart, normal except for accentuation of both pulmonic and aortic second. Liver is enlarged. Spleen, not demonstrably enlarged. Thyroid, slightly enlarged. Right kidney prolapsed. Sputum, positive for tubercle bacilli. Urine, 1020, trace of albumin, granular casts, diazo positive. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs with cavity formation; emphysema of left lung; empyema; fatty liver; parenchymatous nephritis; appendiceal ulcer; pleurisy; enlarged thyroid; accessory spleen; enlarged mesenteric and bronchial glands.

Liver, enlarged; weight, one thousand eight hundred and sixty grams; pale and rather firm; apparently fatty; no amyloid reaction. Microscopic appearance: Moderate congestion with atrophy of some cells and hypertrophy of others; no tubercles found; no increase of fibrous tissue; no newly formed bile-ducts; no amyloid.

Case No. 551. Admitted 4—27—'04. Died 11—20—'04. Physician, Ravenel. Female. White. Single. German. Age, nineteen. Occupation, house-servant. Source of contagion, not elicited. Previous disease, typhoid fever in 1902. Principal symptoms, cough, expectoration, hemoptysis, dyspnea on exertion. Highest weight, ninety-eight pounds; lowest recent weight, ninety-eight pounds; on admission, one hundred and twelve and one-half pounds. Heart, dulness normal; no murmurs. Liver and spleen, not enlarged. Sputum, positive for tubercle bacilli. Urine, negative. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Tuberculosis of both lungs with cavity formation; emphysema; edema; chronic pneumonia; a few miliary tubercles; nephritis; peritonitis; congestion of intestines; red atrophy of liver; enlarged bronchial glands.

Liver, comparatively large; weight, one thousand six hundred and seventy-four grams; color, dark; consistence, normal; upon section shows changes of red atrophy; gall-bladder contains large quantity of tenacious bile. Microscopic appearance: Marked congestion—so marked that the liver-cells in the neighborhood of the hepatic vein are almost totally destroyed; on the periphery of the lobule the cells are in a better state of preservation; no tubercles found; no increase of fibrous tissue; no newly formed bile-ducts; no amyloid.

Case No. 2856. Admitted 11—2—'04. Died 11—30—'04. Physician, Ravenel. Female. White. Widow. Irish. Age, forty-eight. Had seven children. Occupation, housework. No source of contagion elicited. Previous diseases, pleurisy, rheumatism, pertussis. Has been ill three years. Principal symptoms, cough, expectoration, dyspnea on exertion, anorexia, diarrhea, chills. Highest weight, not known; ordinary weight, one hundred and seventeen pounds; lowest recent weight, not known; on admission, weight, seventy pounds. Liver, not palpable. Spleen, thyroid, and kidneys are not palpable. Heart, normal apparently. Sputum, positive for tubercle bacilli. Urine, 1012, no sugar, no albumin, no diazo. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, R. C. Rosenberger: Ulcerative tuberculosis of both lungs; tuberculous pneumonia of both organs; emphysema; edema; tuber-

culosis of left adrenal; tuberculous peritonitis and enteritis; enlarged mesenteric and bronchial glands; adhesive pleurisy. Heart shows thickening and atheroma of mitral and aortic leaflets; heart is very small; weight, one hundred and fifty grams. Spleen shows amyloid reaction.

Liver, apparently normal; normal in color; firm consistence; weight, one thousand seven hundred and sixty-three grams; gall-bladder is distended and contains thin, pale, viscid bile. Microscopic appearance: Moderate congestion; many typical miliary tubercles containing giant-cells, periportal, intra-acinal, and near hepatic vein; no increase in fibrous tissue; no tubercle bacilli found; no newly formed bile-ducts; no amyloid.

Case No. 2926. Admitted 11—26—'04. Died 12—22—'04. Physician, Ravenel. Female. White. Single. Native. Age, nineteen. Occupation, shop-girl. Source of contagion, a friend. Previous diseases, malaria and measles. Duration of illness, three years. Principal symptoms, cough, hemoptysis, expectoration, dyspnea on exertion, diarrhea, night-sweats, amenorrhea. Highest weight, one hundred and ten pounds three years before; ordinary weight, not known; lowest weight, seventy-six pounds three months before; weight on admission, not recorded. Heart, apparently normal. Liver, spleen, thyroid, and kidneys, all normal. Urine, albumin positive, sugar negative, diazo slight; microscopically, pus. Sputum, positive for tubercle bacilli. Diagnosis, pulmonary tuberculosis.

Pathological diagnosis, Joseph Walsh: Tuberculosis of both lungs with cavity formation; tuberculosis of bronchial and mesenteric glands and appendix; dilated right and left ventricle; parenchymatous nephritis. Liver, normal size, dark, no other abnormalities. Microscopic appearance: Marked congestion; cells markedly atrophic; so-called red atrophy; no tubercles found; no amyloid; no increase of fibrous tissue; no newly formed bile-ducts.

Case No. 2855. Admitted 11—1—'04. Died 12—26—'04. Physician, Hatfield. Male. White. Native. Married. Age, twenty-nine. Occupation, plumber. Alcoholic. Source of contagion, a friend. Previous diseases, measles and diphtheria. Duration of illness, two years. Principal symptoms, cough, pain in throat, expectoration, dyspnea on exertion. Highest weight, one hundred and forty-four pounds four months before; ordinary weight, one hundred and forty pounds; lowest weight, one hundred and twenty-one pounds two weeks before; weight on admission, one hundred and thirteen and one-half pounds. Liver, not enlarged. Spleen, kidney, and thyroid, normal. Heart, apparently normal; aortic accentuated. Sputum, positive for tubercle

bacilli. Urine, acid, 1026, no albumin, no sugar, diazo positive. Diagnosis, tuberculosis of lungs, pharynx, and larynx.

Pathological diagnosis, C. Y. White: Tuberculosis of lungs with right-sided pneumothorax; bilateral pleurisy with effusion; miliary tubercle in kidney and diffuse nephritis; the right lung contains cavities; the left, a few scattered miliary tubercles; heart is slightly enlarged and right side is dilated.

Liver is about normal in size; color is yellowish with the markings of the capillaries distinct; the consistence is firm; the liver projects 6 cm. in the mid-sternal line. Microscopic appearance: Moderate congestion with pronounced atrophy of the liver-cells; one atypical miliary tubercle, intra-acinal in position; contains small round-cells, epithelioid cells, and caseation, but no giant-cells; no tubercle bacilli; no fibrous tissue; no newly formed bile-ducts.

Case No. 3010. Admitted 12-22-'04. Died 1-9-'05. Physician, Stanton. Male. White. Single. Native. Age, thirty-seven. Occupation, stevedore. Markedly alcoholic. Source of contagion, not elicited. Previous diseases, syphilis, twenty years before. Duration of illness, two years. Principal symptoms, cough, expectoration, marked dyspnea, hoarseness, diarrhea, edema of feet. Highest weight, two hundred and ten pounds five years before; ordinary weight, one hundred and eighty to one hundred and eighty-five pounds; lowest weight, one hundred and forty pounds six months before. Heart, enlarged; both second sounds accentuated. Liver, palpable, edge sharp and painless. Spleen, enlarged in proportion. Thyroid, apparently normal. Kidney, not palpable. Sputum, positive for tubercle bacilli. Urine, 1020, neutral, no sugar, trace of albumin, diazo positive; no casts. Diagnosis, pulmonary tuberculosis; arteriosclerosis; cirrhosis of the liver, hallucinations.

Pathological diagnosis, C. Y. White: Chronic tuberculous arthritis of hip-joint; chronic and acute tuberculosis of lungs; cavity small in right lung; acute miliary tuberculosis of kidney; fatty cirrhosis and acute miliary tuberculosis of liver; chronic obliterating pleurisy and pericarditis; ischiorectal abscess and ulceration of rectum; chronic tuberculous adenitis of pelvic and abdominal glands; tuberculosis of adrenals; tuberculosis of bladder and prostate.

Liver, 25 by 17 by 9½ cm; weight, two thousand two hundred and nineteen grams; color, mottled yellowish to brown and studded with yellowish-white tubercles; consistence, much softer than normal; surface, granular; throughout the organ there are numerous small miliary tubercles. Microscopic appearance: Numerous miliary tubercles both with and without giant-cells; the tubercles are periportal and intra-acinal in position; there are numerous tubercle bacilli found; there is an increase of fibrous tissue, the fibrous tissue

radiating from about the portal vein between the liver-cells; no amyloid; slight congestion; no newly formed bile-ducts.

JOSEPHUS T. ULLOM.

REFERENCES.

1. Louis, "Recherches sur la phthisie," Paris, 1843.
2. Forster, "Handbuch der spec. pathologisch Anatomie," 1854.
3. Bristowe, "Transactions British Path. Soc.," vol. ix, 1858, p. 241.
4. Waldenberg, "Die Tuberculose," Berlin, 1869.
5. Arnold, "Virchow's Archiv," Bd. lxxxii, 1880.
6. Simmonds, "Deutsches Archiv für klin. Med.," 1888.
7. Zehden, "Centralblatt für path. Anat.," vol. viii, 1897.
8. Rolleston, "Diseases of the Liver."
9. Baumgarten, "Zeitschrift für klinische Med.," Bd. ix and x.
10. Brissard and Loupet, "Etudes exp. sous la direct. du prof. Verneuil," i, Paris, 1887.
11. Hanot and Lauth, "Etudes exp. sous la direct. du prof. Verneuil," ii, Paris, 1888.
12. Koeckel, "Virchow's Archiv," Bd. cxliii, 1896.
13. Fraenkel, "Zeitschrift für klin. Med.," Bd. v, 1880.
14. MacKenzie, "British Path. Soc.," 1890.
15. Waring, "Diseases of the Liver."
16. "Medical News," April, 1904.
17. Wagner, "Deutsches Archiv für klin. Med.," Bd. xxxiv, 1884.
18. Von Honl, "Acad. des Sciences de l'empereur Franz Joseph I," Bulletin International Prague, 1895.
19. Simmonds, "Centralblatt für allgemeine Path.," November, 1898.
20. Kotlar, "Zeitschrift für Heilkunde," Bd. iv, 1894.
21. Koester, "Centralblatt für innere Medicine," 1896.
22. Clement, "Virchow's Archiv," Bd. cxxxix, S. 35.
23. Orth, "Virchow's Archiv," Bd. lxvi, 1871.
24. Brieger, "Virchow's Archiv," Bd. lxxv, 1879.

PNEUMOTHORAX.

This report is made on the cases of pneumothorax coming to autopsy in the first two years of the Phipps Institute.

Frequency.—There are ten cases out of a total of one hundred and eleven autopsies (9 %). This is about the usual percentage. Weil found pneumothorax in 10.1 % of three hundred and fifty-five autopsies, and West, from a review of the literature, concludes that in 5 % of all fatal cases this complication is the cause of death.

Sex.—Nine of the cases were males and one a female. This marked difference between the sexes was also seen in Emerson's cases, four out of twenty-two being women. The reason for this is at present not clear.

Onset.—Seven of the cases were sudden and three were gradual. By gradual is meant that no definite time of occurrence could be determined from the history or from the chart in the hospital cases. Very likely the number, density, and distribution of the pleural adhesions influenced this. It is possible that, in the ones with gradual onset, there is a slow separation of the walls of the pleura from each other.

Location.—Six of the cases were right-sided and four were left-sided. As to the side most often affected, there is a difference of opinion. Weil, Reynaud, and others hold that the left side is twice as frequently affected as the right. Drasche found the pneumothorax on the right side in 55 % of one hundred and ninety-eight cases. In Emerson's cases there were eleven on each side.

Duration.—This is difficult to estimate, especially in the cases with "gradual" onset. So far as could be determined, the dura-

tion was under two weeks in six cases, three weeks in one, two months in one, three months in one, five months in one. Some cases have lasted longer than this, but only those autopsied within the year are reported upon.

Decubitus.—This is not often mentioned in describing pneumothorax. Emerson states that the patient lies on the affected side, but in his cases decubitus was recorded only twice, and in one of these the patient lay on the sound side. Of the present series of cases the decubitus was noted in four, and three of these rested on the unaffected side.

Dyspnea.—This was not noted in three cases. It was marked in four cases, marked at first in two, not marked in one. It is of importance to remember that pneumothorax is not necessarily associated with dyspnea.

Enlargement of the Affected Side.—This was not noted in six cases. It was present in three cases, absent in one.

Obliteration of Interspaces.—Not noted in six cases. The spaces were less marked in three cases; there was no difference in one.

Motion of Affected Side.—Not noted in five cases, lessened in four, no change in one.

Fremitus.—Not noted in eight cases, diminished in two.

Percussion.—As described in text-books, the percussion-note usually is tympanitic. If we take tympany to mean the sound obtained over a cavity, or by percussing the cheek, it is infrequent in pneumothorax. The typical note is a full, booming hyperresonance. This was the note present in six cases examined by the author. In three cases examined by others the note is given as tympanitic; in one the character of the note is not recorded.

Vocal Resonance.—Not noted in six cases, diminished in two, normal in one, exaggerated in one.

Breath-sounds.—Not noted in two cases, feeble in four, amphoric in three, exaggerated in one.

Râles.—Not noted in seven cases, present in three.

COMPARISON OF PNEUMOTHORAX CASES.

No. Age.	Sex.	Onset.		Location.		Duration.	Decubitus.		Dyspnea.	Side Enlarged.		Interspaces.	Motion.	Femuritus.	Character of Percussion-note.		Movable Dulness.		Breath-sounds.	Vocal Resonance.	Rales.	Coin Test.	Tinkling.	Splash.	Displaced Heart.	Displaced Liver.	Remarks.
		Sudden.	Gradual.	Left.	Right.		Left.	Right.		Abent.	Present.				Abent.	Present.	Abent.	Present.									
282	M.	x		x		5 mos.	x	x	x	x	x	(*)	(*)	(*)	x	x	x	+	(*)	Exaggerated.	Present.	Present.	Present.	Displaced.	Displaced.	No pain.	
45	M.	x		x		2 to 3 weeks.	x	x	x	x	x	Obt.	x	x	x	x	x	x	—	(*)	Present.	Present.	Present.	Displaced.	Displaced.	No pain.	
889	M.	x		x		3 days.	x	x	x	x	x	(*)	(*)	(*)	x	x	x	(*)	(*)	(*)	Present.	Present.	Present.	Displaced.	Displaced.	Pain marked.	
2238	M.	x		x		In house 8 days.	x	x	x	x	x	(*)	(*)	(*)	x	x	x	(*)	(*)	(*)	Present.	Present.	Present.	Displaced.	Displaced.	No pain.	
25	M.	x		x		2 days.	x	x	x	x	x	+ Norm.	x	(*)	x	x	x	(*)	Amph.	(*)	Present.	Present.	Present.	Displaced.	Displaced.	No pain (?)	
35	M.	x		x		?	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	No pain (?)	
1278	M.	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	No pain (?)	
24	M.	x		x		2 mos. (?)	x	x	x	x	x	+ Norm.	x	(*)	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
1033	M.	x		x		2 mos.	x	x	x	x	x	(*)	(*)	(*)	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
35	M.	x		x		2 days.	x	x	x	x	x	(*)	(*)	(*)	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
2855	M.	x		x		3 mos.	x	x	x	x	x	+ Norm.	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
29	M.	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
714	M.	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
24	M.	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Pain.	
1160	F.	x		x		12 days.	x	x	x	x	x	Norm.	x	(*)	x	x	x	x	Amph.	(*)	Present.	Present.	Present.	Displaced.	Displaced.	Foul odor to sputum; pain marked.	
32	F.	x		x			x	x	x	x	x	x	x	x	x	x	x	x	x	x	Present.	Present.	Present.	Displaced.	Displaced.	Foul odor to sputum; pain marked.	

(*) Not noted.

Coin Test or Bell Tympany.—This was present in all cases examined—nine.

Metallic Tinkle.—Not noted in seven cases, absent in three.

Hippocratic Splash.—Not noted in nine cases, absent in one.

Movable Dulness.—Not noted in three cases, present in four, absent in three.

Displaced Heart.—Not noted in three cases, displaced in five, not displaced in two.

Displaced Liver.—Not noted in six cases, displaced in three, not displaced in one.

From so small a number of cases and from the somewhat incomplete examinations, conclusions are scarcely justifiable. Certain points, however, are worthy of note:

(1) The onset may be slow, painless, and without dyspnea or other symptom to attract the patient's attention.

(2) The patient may, and often does, lie on the unaffected side.

(3) The size of the chest, the condition of the interspaces, and the motion may be unchanged.

(4) The breath-sounds may be absent, feeble, exaggerated, or amphoric. Similarly, the vocal resonance may be diminished, increased, or unchanged.

(5) Especially to be emphasized is the percussion-note, which is most often of a deep, full, booming hyperresonance or bass-drum character.

For diagnosis the points most helpful are: hyperresonance, coin test, displaced heart and liver, tapping.

WILLIAM B. STANTON.

IMMUNIZATION IN TUBERCULOSIS.

During the first year of the Henry Phipps Institute a course of lectures was given as part of the Institute's educational work by men from different parts of the world. One of the lectures was by Professor Edward Maragliano, of Italy, who being unable to appear in person on account of serious illness, sent a paper on the "Specific Therapy of Tuberculosis and Vaccination Against the Disease." This paper was read in abstract before a gathering of medical men from different parts of the United States, and subsequently was published in the First Annual Report of the Institute. Professor Maragliano claimed in his paper: "(1) That it is possible to produce a specific therapy for tuberculosis. (2) That it is possible to immunize the animal organism against tuberculosis as is done in other infectious diseases, and that there is good reason to hope for an antituberculous vaccination for man."

As the claim made by Professor Maragliano had a most important bearing upon the crusade against tuberculosis in the interest of which the Henry Phipps Institute had been organized, and as he made the announcement of his work and discovery under the auspices of the Institute, it was deemed proper that the Institute should verify his work for the American public or disprove it. With this object in view Dr. M. P. Ravenel was sent to Professor Maragliano's laboratory to study his work and learn his methods. He was instructed, while in Europe, also to study other work in serumtherapy. Dr. Leonard Pearson was likewise sent to Europe to study immunization work in animals. Both Dr. Ravenel and Dr. Pearson spent some months in Europe, and during that time visited all the principal laboratories in which serum work or immunization work

had been done. They were kindly received everywhere, and were given opportunity to observe immunization work in different parts of the world. The Institute here publicly acknowledges the courtesy extended by the different laboratories of Europe to its representatives, and expresses its appreciation of it.

Drs. Ravenel and Pearson each have made a detailed report of their observations, and have summarized in this report all work on immunization up to the time of this report. The Institute has taken up serumtherapy along the lines laid down by Professor Maragliano, and is studying immunization in general. As yet a verdict cannot be given. All that can be done is to report the work and let it speak for itself. The clinical work of the Institute accomplished during the year is presented by Drs. Joseph Walsh, Wm. B. Stanton, and H. R. M. Landis. This was done with serum imported from Professor Maragliano's laboratory. Since then work has been done with serum manufactured by the Institute itself, and this will be reported in a subsequent volume.

LAWRENCE F. FLICK.

A REPORT ON PROFESSOR MARAGLIANO'S METHOD OF PRODUCING A SPECIFIC SERUM

FOR THE TREATMENT OF TUBERCULOSIS AND OF VACCINATING AGAINST
TUBERCULOSIS, WITH OBSERVATIONS UPON THE TREATMENT CAR-
RIED OUT WITH THE SERUM IN PROFESSOR MARAGLIANO'S
CLINIC. ALSO A REPORT ON MARMOREK'S SERUM WORK.

The writer was appointed by Dr. Flick to investigate Professor Maragliano's serum work and study his methods. He went to Genoa, and spent six weeks in Professor Maragliano's laboratory and clinic. He then visited other parts of Europe and six weeks subsequently returned to Genoa for the purpose of examining the patients who had been under treatment with the serum during his stay there. This gave practically three months for observation of the therapeutic effects of the serum. Every facility for observation and study was given by Professor Maragliano and his assistants. The writer desires here to record his appreciation of the many courtesies shown by Professor Maragliano and his associates, and to express admiration of the open way in which everything is carried on, there being no concealment of any kind in the institution of which Maragliano is the founder and head.

HISTORY OF SERUMTHERAPY.

Before going into the details of Professor Maragliano's methods, it may be of interest to review briefly the work of other experi-

menters who have attempted to discover a specific therapy for tuberculosis.

The first attempts in this direction seem to have been the outcome of the studies of Pasteur, who pointed out the antagonism which apparently existed between certain species of bacteria when cultivated together. Acting upon this principle, in 1886, Cantani employed inhalations of cultures of the so-called "bacterium termo" in the treatment of tuberculosis, believing that it would combat the growth of the tubercle bacillus in the body, as it destroyed it in culture. Further researches showed that the supposed species "bacterium termo" really consisted of a number of putrefactive bacteria.

Better known is the attempt of Petruschky, based on the same idea, to cure lupus by injections of streptococci. It is now known that the streptococcus is one of the most common, as well as most injurious, of the secondary or mixed infections in tuberculosis, and it seems that only harm could have come from such practice. The same may be said of the experiments attributed to Portucalis, who advocated the inoculation of tuberculous persons with syphilis, believing that the two diseases were antagonistic to each other.

The serum treatment of tuberculosis had its origin in the hemotherapy of Héricourt and Richet in 1889. These authors found that the intraperitoneal infusion of normal dog's blood conferred a certain immunity on rabbits against a septic organism discovered by them—the staphylococcus pyosepticus. When the blood of a normal dog was injected after infection with the staphylococcus pyosepticus, 75 % of the rabbits were saved; when, however, the blood of a dog which had recovered from infection with the staphylococcus pyosepticus was used, all the rabbits were saved. Encouraged by these results, and reasoning that the supposed immunity of dogs against tuberculosis implied some protective power in their blood, Héricourt and Richet carried out an extensive series of experiments, injecting the blood of dogs into the

peritoneal cavity of rabbits infected with the avian tubercle bacillus. Their results showed that while 55 % of the rabbits not receiving the dog's blood died, only 17 % died after such treatment. They conclude that—(1) in virulent infections the injection of the blood retards, but does not arrest, the evolution of tuberculosis; (2) in moderately virulent infections the injection of blood arrests the disease; (3) the blood of tuberculous dogs has more protective power than that of healthy animals; (4) too large doses of the blood of tuberculous dogs hasten the march of tuberculosis.

After two years of experiment, in 1891, Héricourt, Langlois, and St. Hilaire began the use of dog's blood for the treatment of human tuberculosis in one of the Paris hospitals, with apparently good results. Feulard reported undoubted amelioration of the local lesions in lupus; while Pinard and Landouzy obtained equally striking results in the young babies of tuberculous mothers, who showed congenital debility. In the treatment of these cases, however, Landouzy found that an artificial serum produced equally good effects, showing that there was nothing specific in the dog's blood.

Prior to this, in 1890, Bertin and Picq, believing that goats were immune to tuberculosis, had experimented by transfusion of their blood into rabbits, and believed that they produced in this manner a "bactericidal" condition of the blood against the tubercle bacillus. This was observed only when the transfusion and inoculation were made simultaneously—when the transfusion was done later it had no effect.

They employed this treatment in some ten cases of human tuberculosis of various types, with supposed good results. Following their example, Lepine and S. Bernheim employed the method with a certain amount of success, as reported.

In 1892 Bouchard repeated the experiments of Héricourt and Richet, and found that his treated animals died more quickly than the controls.

It was also demonstrated by various authors that birds, dogs, and goats, all of which had been supposed to be immune to tuberculosis, were not so in fact, possessing only a relative resistance to the disease. Beginning about this time, and to a certain extent as the result of the work which had gone before, new ideas as to immunity in tuberculosis became current, and since then all efforts have been directed toward the production of immunity after the methods of Pasteur—by attenuated cultures; or by the use of the toxins and products of the tubercle bacillus; or by varying combinations of the two, the object being to bring about a true vaccination against the disease in some of the lower animals, with the formation of antibodies in the blood, which could then be used for the passive immunization, as well as the treatment, of man.

Héricourt and Richet were the first to attempt this, remembering that in the case of rabbits infected with staphylococcus pyosepticus they had been able to save them by injections of the serum of dogs which had recovered from the same infection. They still preferred dogs for the production of their serum. The dogs were infected with avian or with human tubercle bacilli, but immunity does not appear to have been produced before the employment of the serum. The serum then was only that of a tuberculous dog, and was used with the idea that both toxin and antitoxin would be in the blood of such an animal.

Daremborg, working along these lines in the laboratory of Strauss, found that rabbits treated with the serum of infected dogs, and then inoculated with human tubercle bacilli, died more rapidly than the controls.

In 1893 Babes published results obtained by using the blood of dogs which had been vaccinated against tuberculosis. He found that the serum had both prophylactic and curative properties on his experimental animals. Employed in cases of human tuberculosis, he reported excellent results, especially where the disease was localized. In cavernous cases he observed marked amelioration

of symptoms, with gain in weight and strength, lessening of cough, and in two cases progressive diminution and even disappearance of bacilli from the sputum.

In 1894 von Bernheim undertook the production of a serum from goats, horses, asses, and small laboratory animals. His material for injection was the fluid culture-medium on which tubercle bacilli had been grown, passed through a Kitasato filter. The treatment was kept up a half year. Bernheim considered the serum bactericidal, prophylactic, and curative. He employed it in upward of three hundred cases of consumption, and claimed a good proportion of successful results in patients in the first and second stages of the disease.

In 1895 Redon and Chenot produced a serum in asses and mules by the subcutaneous injection of "tuberculous products," among which they mention—(1) emulsions of cultures of tubercle bacillus ten, six, and three months old; (2) emulsions of human tuberculous products after one, two, and three passages through guinea-pigs. They also used injections of tannin mixed with their emulsions. After repeated injections the asses and mules produced a serum which had marked effect on the evolution of tuberculosis in guinea-pigs and rabbits. This action they found much more intense in the serum of animals first "tannised," and then treated with emulsions of tuberculous products of high virulence.

In this year also Boinet, having obtained very successful results in guinea-pigs with the serum of a goat which had been immunized against tuberculosis, used the same treatment in a series of cases of human tuberculosis. Favorable results were observed in slow and apyretic types of the disease, and also in two cases which had reached the second stage; but in cases with cavities it was found useless.

About the same time Broca and Charrin tried the serum of dogs which had been rendered tuberculous by Charrin and Pottevin in cases of cutaneous tuberculosis, and concluded that

it had no specific power, though in the treatment of certain cutaneous ulcerations it seemed to be an efficacious adjuvant.

In August, 1895, Maragliano announced at Bordeaux his discovery of a serum for the treatment of tuberculosis, which will be described further on.

In this year also Paquin gave the results of his attempts to produce a serum against tuberculosis. He used horses for this purpose, injecting them successively with the sterilized bouillon on which tubercle bacilli had been grown, then with the bacilli killed by heat, and finally with living bacilli. He reported good results in the use of this serum. Among those who have employed it, some confirm Paquin's results, but others deny any value to the serum.

Viquerat, in 1896, attempted to immunize mules by the intravenous injection of bouillon cultures of tubercle bacillus. From these animals he obtained serum which protected guinea-pigs entirely from tuberculous infection and gave brilliant results in the treatment of human tuberculosis, especially in cases of bone affection. During the same year, however, Rutkowski repeated the experiments of Viquerat, and reached diametrically opposite conclusions. In fact, he found that the serum was distinctly injurious, and even caused death in many of the experimental animals.

Auclair, in 1896, attempted to immunize fowls by the injection of human tubercle bacilli and the bouillon on which the cultures had been grown. The serum of fowls so treated had no appreciable protective power on guinea-pigs, and the author concluded that no antitoxic substance had been formed in the blood of the fowls in consequence of his treatment.

During this year the work of Nieman appeared. This author made use of young goats, injecting first tuberculin made from highly virulent cultures, and after a time following this treatment by injections of the alcoholic precipitate from tuberculin, both being given in ascending doses. The resulting serum gave very

good results in guinea-pigs, most of them surviving eighteen months, while controls died in fifteen weeks. In man, however, it failed to produce the cure of tuberculosis, though it prevented the tuberculin reaction from taking place. It was essentially an antituberculin serum.

During the year 1897 we have records of many attempts to produce a specific serum against tuberculosis.

DeSchweinitz reported his work in this direction, which was really a continuation of his immunization experiments published in 1894. He attempted to immunize one cow by the repeated injection of large quantities of tuberculin. Two other cows received increasing doses of an attenuated culture of the tubercle bacillus described in the paper mentioned (1894). Two horses were treated with injections of attenuated cultures, culture fluid, and bacilli.

The serum produced by DeSchweinitz had marked effect on guinea-pigs. A number of physicians (Trudeau, Stubbart, Richardson) made use of it, with some encouraging results.

McFarland, during this year, produced a serum in asses by injections of the old tuberculin, which he designated "antituberculin." It was used in the treatment of about twenty cases, some of which showed definite improvement. McFarland concludes: "I think we have in antituberculin a substance useful in the treatment of tuberculosis, in that it ameliorates certain symptoms seemingly associated with the toxic conditions present."

Fisch also produced about this time his "antiphthisic serum T.R." He began his immunization by injections of Koch's new tuberculin "T.R.," adding later the "T.O." He considered his serum both antitoxic and bactericidal. Numerous favorable reports have been made of this serum, but it cannot be regarded as a specific.

Peron (1897) made use of pus from cold abscesses, rendered sterile by prolonged exposure to light, for the production of immunity, by intraperitoneal inoculation. He found that his

method diminished only the toxic effects of the substances contained in the bacilli and had no effect against the living germs.

Patterson, in October, 1899, reported his experiments. He immunized fowls and found that their serum had the power to render rabbits and guinea-pigs immune to mammalian tubercle bacilli. He used the serum on himself, and recommended it as a prophylactic for persons with a tuberculous history or tendency.

Maragliano's Work.—As before mentioned, Maragliano's first communication appeared in 1895, since which time he has from time to time contributed numerous articles describing his advances. His last and most complete paper was prepared for and published by the Henry Phipps Institute.

After more than fifteen years of experiment and study Maragliano announced in this paper two conclusions:

1. That it is possible to produce a specific therapy for tuberculosis.

2. That it is possible to immunize the animal organism against tuberculosis as is done in other infectious diseases, and that there is good reason to hope for an antituberculous vaccination for man.

Methods: The serum for therapeutic use is produced from horses and cows, following in general the methods employed in the production of other sera against infectious diseases—that is, a progressive active immunization of the animals, during which defensive antibodies are produced in the blood. The methods of bringing about this immunization, and of exactly measuring the protective power of the serum of immunized animals, constitute the pith of Maragliano's discoveries. One of the great difficulties in the way of producing an antituberculous serum has always been the apparent impossibility of obtaining the sum-total of the toxins formed by the tubercle bacillus. This difficulty Maragliano believes he has overcome.

The animals to be immunized receive under the skin increasing quantities of two preparations—Liquid F. and Bacillary Pulp. The former of these consists of equal parts of Maragliano's watery

tuberculin and the filtrate from living and virulent tubercle bacillus cultures, obtained by passage through the Pasteur-Chamberland filter. The bacillary pulp is made up, as its name implies, of the substance of the tubercle bacilli, unaltered by heat or other agents. It is obtained by grinding the bacilli with sand in water and subsequent passage through a Pasteur-Chamberland filter. Equal quantities of these two fluids are injected at the same operation, but in different parts of the body. If there is no marked fever and no local reaction, a second injection is given after three days, the quantity being doubled. Subsequent injections are made at intervals and in quantities depending upon the condition of the animal and its reaction to the injections, both local and general, the dose, however, being progressively increased. This process is kept up until the serum of the animal is found to have a high agglutinative and protective power, as tested by Maragliano's methods, to be described later.

Test-bleedings may be made from time to time to determine the progress of immunization.

Agglutination: This is carried out after the method of Courmont and Arloing. The serum to be tested is added to a homogeneous culture of the tubercle bacillus in test-tubes in varying proportions. Twenty-four hours are allowed to elapse before a reaction is considered negative. In using this method for the estimation of the production of antibodies it must be remembered that very minute doses of tuberculin will entirely prevent the reaction, consequently some days—ten to fifteen—must be allowed to elapse between the last injection and the test-bleeding. This property increases step by step with the antibacterial power of the serum, not with antitoxic power.

Standardization: The serum is standardized by means of Maragliano's test-poison. This test-poison is his watery tuberculin, and is made of such strength that it will kill surely in doses of 1% of the body-weight. If death occurs in less than twenty-four hours, the test-poison is too strong and must be diluted

with normal salt solution. If the animal lives more than five days, the test-poison is not strong enough and must be concentrated. Having a standardized test-poison, the protective power of a serum is determined by finding out how much serum is required to protect an animal against the known fatal dose of the test-poison.

The potency of the serum is measured in terms of antitoxic units. A serum of which one gram would be required to protect one gram of animal from the known fatal dose of test-poison would be said to contain one antitoxic unit. If one gram of serum would protect one hundred grams of animal, it would then contain one hundred antitoxic units, and if one gram of serum would protect one thousand grams of animal, it would contain one thousand antitoxic units. No serum is allowed to leave Maragliano's institute that does not contain at least one thousand antitoxic units per cubic centimeter.

Every bleeding is tested in the above manner before being used for therapeutic purposes.

Experiments with serum: The serum has the power of producing passive immunity very rapidly. In one series of experiments, after five subcutaneous injections on alternate days the blood of the rabbits injected agglutinated in the proportion of one to three hundred and fifty. An emulsion of a culture known to be virulent was then injected into the circulation through the aural vein. None of the rabbits showed any illness, and when killed, were found to be free from tuberculosis. The controls showed tuberculosis of the liver and spleen. The dose given was five milligrams of partially dried culture, this having been previously determined to be the fatal dose. When inoculated into the anterior chamber of the eye, even after one or two subcutaneous injections of serum, rabbits escaped either without injury or with the development of a few isolated tubercles in the iris. In no case did general infection or panophthalmitis develop. The controls developed panophthalmitis always. When serum and bacilli were mixed in vitro and injected into the anterior chamber

of the eye, isolated tubercles usually developed, but without generalization and without loss of the eye.

Therapeutic use of the serum: The serum is in regular use at the Ambulatory Clinic of Professor Maragliano, which is under the charge of Dr. Figari. Upward of fifty patients were seen under treatment. Most of these were of the very poor classes, unable to supply themselves with proper nourishment or to give themselves a proper amount of rest. The chief food of all of them was "pasta"—different forms of macaroni. A few of them took a fair quantity of milk and eggs. None of them spent more than one or two hours a day in the open air, except a few whose occupation was outdoor work, and without exception all of them slept in rooms with the windows tightly closed, the fear of night air being very prevalent all through Italy, even in the highest classes. A number of houses were visited for the purpose of inspection. They were found to be clean, but the rooms were small and the ventilation very poor. In a fair proportion the construction was such that no sun ever reached them. In practically every case the serum was given under what might fairly be considered adverse circumstances, and the treatment consisted solely in the injections of the serum. The period during which it was possible to keep patients under observation was not long enough to form a positive opinion of the value of the serum in the treatment of tuberculosis, and judgment must be suspended until a greater number of cases has been observed and the patients kept track of for a longer time. In a chronic disease like tuberculosis it is especially difficult to form a correct estimate of any particular drug or method of treatment.

Review: In view of the experiments quoted, as well as many others of like character, it appears established that Maragliano has succeeded in producing a serum which protects experimental animals against the poisons of the tubercle bacillus, so far as we have been able to obtain them, and also against the tubercle bacillus itself, in pure culture, when given in doses which

do not overwhelm the animal, but which have been shown to be fatal. From the laboratory standpoint it seems that his claims cannot be successfully contested. The curative value of his serum is not so well established. One great difficulty here lies in the fact that the large majority of cases of tuberculosis which come under observation show the effects of mixed infection. Maragliano lays stress on this distinction between tuberculosis of the lungs and phthisis, in which he is scientifically correct. Practically, however, it is generally phthisis that we are called upon to treat. It seems reasonable to believe, nevertheless, that in cases of phthisis, if we are able to combat the tuberculous infection, we are in a better position to handle the other infections, and with one source of trouble out of the way, the person with phthisis must stand a better chance of recovery. Only a large clinical experience can prove or disprove the correctness of this view, and the practical value of Maragliano's serum in the general run of cases of tuberculosis. Certainly there is strong ground for hope.

Vaccination: Maragliano also practises a method of vaccination or active immunization against tuberculosis. His material consists of one milligram of dried tubercle bacilli, heated to 150° C. in glycerin for one and one-half hours. The injection is made in three points, about one and one-half inches apart. Following the injection there forms an area of induration more than an inch in diameter, with a small pustule at the center, accompanied with some fever. After all local and general symptoms have subsided a second series of inoculations is made, exactly like the first. This is not followed by symptoms, either local or general. Only two or three cases were seen, and the subject is one which will obviously require many years to form an opinion of. The absence of reaction after the second inoculations shows the establishment of some degree of tolerance apparently.

Serum of Marmorek.—In the autumn of 1903 Dr. Alexander Marmorek, at that time connected with the Pasteur Institute in Paris, announced that he had produced a serum which was vacci-

nal and curative. I had already, in the spring of 1903, made a trip to Paris to obtain information about Dr. Marmorek's work, but he was not at that time ready to make his findings public. Unfortunately, at the time of my visit in 1904, Dr. Marmorek was away in Austria, having been ill for some time. I was given all desired information and literature by Dr. Jacobson, who had charge of the laboratory in Dr. Marmorek's absence.

Marmorek takes issue with the old views concerning tuberculin. He does not believe that it is the specific toxin of the tubercle bacillus, nor even the principal factor in the production of lesions of tuberculosis, hence any serum produced by injections of tuberculin contains antibodies only against tuberculin, and not against the tubercle bacillus or the morbid changes produced by it. The explanation generally given for the tuberculin reaction he considers very faulty. Why does it produce such unequal effects in a healthy animal, one slightly diseased, and one far advanced in tuberculosis? He holds that no satisfactory explanation has been given for the inflammatory reaction around tuberculous foci caused by injections of tuberculin.

He believes the true explanation of the known phenomena following the injection of tuberculin is found in considering tuberculin as a preparatory substance, which, acting on the bacilli themselves, leads to the secretion of a toxin entirely different from tuberculin. In other words, tuberculin acts as a stimulant on the bacilli, causing them to form their specific toxin, and to the absorption of this toxin the reaction is due. It begins only after time enough has passed to allow the formation of a sufficient quantity of toxin in the tuberculous foci.

No reaction takes place in a healthy animal because there are no tubercle bacilli to be stimulated. In a moderately diseased animal every focus is stimulated and reaction follows. In badly diseased animals the amount of toxin freshly produced is negligible compared to what must already exist in the numerous foci of the body. It may even be questioned if the bacilli are capable of be-

ing stimulated further in such cases. This true toxin is not found in ordinary cultures, because the conditions do not approach closely enough to those found in the body, which may be considered the normal habitat of the tubercle bacillus. Marmorek holds also that this toxin is formed by very young, or what he terms "primitive," bacilli. In older cultures tuberculin is found. His efforts were turned to the discovery of a culture-medium which would approach body conditions, and at the same time keep the bacilli as long as possible in the "primitive" state, in order to increase the toxicogenic power. As in the body the tubercle bacillus is often found in the interior of the leucocytes, he conceived the idea of growing them in contact with freshly drawn leucocytes. This was found to have no good effect. The next step was the production of a leucotoxic serum, which was obtained by injecting calves with the leucocytes of guinea-pigs. On this medium the tubercle bacillus produces more of its specific toxin, and the cultures remain free from tuberculin for a considerable time. In order to lengthen the primitive stage of life a glycerin bouillon made from liver was added, on account of a supposed immunity possessed by the liver to tuberculous invasion. The tubercle bacillus required some time to become habituated to this medium of culture, but after a time growth took place, and in successive cultures increased in virulence, forming the specific toxin almost to the entire exclusion of tuberculin. The toxin produced in this manner will kill a guinea-pig of medium size in eight days, the dose being eight to ten cubic centimeters, given under the skin.

Horses are used for the production of serum, the general method followed being successive injections of the toxin described. The injections are followed by large and painful edemas and a rise of temperature. Absorption of the tumor is slow, and it requires seven or eight months to immunize each animal.

In doses of fifteen to twenty cubic centimeters injected under the skin three days before infection the serum protects rabbits from the effects of an intravenous inoculation of tubercle bacilli.

Marmorek also gives the following experiment, which he says has been repeated many times. Rabbits of medium size are given an injection of one or two drops of a suspension of tubercle bacilli into the aural vein. Several hours after twenty cubic centimeters of the serum is given under the skin to some of these. The next day a second lot receive twenty-five cubic centimeters, and a third lot are injected on the second and third days. Some are kept as controls without serum injections. As the controls die a rabbit from each lot is killed, and they have been found always free from disease. Those not killed survive indefinitely in perfect health.

I have not been able to observe patients treated with Marmorek's serum, so can form no judgment of its value. It has received very adverse comment from Dieulafoy, Lucas-Champonniere, Hallopeau, and others; while Latham in England, Richer in Canada, and Frey in Germany give favorable reports of its action.

I have been unable to learn of any other laboratories which have produced a serum against tuberculosis. Studies in the production of immunity against tuberculosis are being carried on in many places, and very successful results have been obtained in cattle. With Dr. Pearson I visited the laboratories in Berlin, where interviews were had with Professors Koch, Schutz, Ostertag, and others. In Hannover, Dammann showed us many interesting experiments. We were unfortunate in missing Professor Ribbert, of Göttingen. In Marburg, Professor von Behring received us most courteously, and gave us every opportunity of examining his immunized herds. I visited also the Universities of Leyden and Utrecht in Holland, to observe the work of Drs. deJong and Thomassen, but both of these gentlemen were away on vacations.

As this phase of the investigation was intrusted to Dr. Pearson, an account of the work will be found in his report.

M. P. RAVENEL.

A REVIEW OF RECENT INVESTIGATIONS AND OBSERVATIONS UPON THE IMMUNIZATION OF ANIMALS AGAINST TUBERCULOSIS.

Efforts to immunize animals against tuberculosis may be said to have commenced earnestly with the discovery of tuberculin by Koch in 1890.* This toxic substance produced by the tubercle bacillus in vitro was reported by Koch† to have the effect of immunizing experimental animals, of retarding the progress of tuberculosis, and, in some cases, it was thought to cure laboratory animals artificially infected. Koch observed that when a healthy guinea-pig is inoculated subcutaneously with a pure culture of tubercle bacilli the lips of the inoculation wound at first unite and adhere and the wound appears to heal. After from ten to fourteen days a hard nodule forms, which breaks and continues as an open ulcer until the death of the animal. But the condition is quite different when an already tuberculous guinea-pig is inoculated. In such an animal the wound unites at first, as before, but no nodule forms, and on the second or third day the seat of inoculation is hard and dark, the skin becomes necrotic and sloughs off, leaving a flat, shallow ulceration which usually heals rapidly and permanently. Koch also found that dead tubercle bacilli rubbed up in water could be injected in large quantities into healthy guinea-pigs without injury other than suppuration at the point of injection, and that small quantities administered to infected guinea-pigs had the effect of prolonging the life of the

*" Proceedings International Medical Congress," Berlin, 1890.

† "Deutsche med. Wochenschrift," No. 46, 1890; "Deutsche med. Wochenschrift," No. 3, 1891.

animals so treated. It, therefore, appeared to be probable that tubercle bacilli contain some specific soluble substances capable of exerting a curative action. It was in an effort to discover this substance that tuberculin was made. Numerous experiments with tuberculin as a preventive and as a cure for tuberculosis of animals were made during several years following the discovery of this substance. It was at last established that while tuberculin had a specific effect upon the lesions of tuberculosis, and in some cases causes the lesion to become encapsulated, to recede, or to disappear, this effect is by no means constant, and is not sufficiently frequent to make this mode of treatment of practical value.

Experiments with tuberculin as a remedy for tuberculosis of cattle were made by the writer of this report in 1892, and were reported in the "Proceedings of the First International Veterinary Congress of America" in October, 1893. These experiments were made upon cows, and showed that the general effect of tuberculin on a tuberculous animal was to cause the disease to pursue a chronic course, or, in some cases, to become latent, but not to disappear.

The insufficient protection and the insufficient healing effect following the use of tuberculin led to efforts to discover other toxins that might give better results. Several modified tuberculins have been produced by Koch, E. Klebs, von Ruck, von Behring, Buchner, Hirschfelder, Maragliano, and others, but none of them has been sufficient to render an animal immune to tuberculosis permanently or to a practical degree.

Koch* came to the conclusion that it was necessary, in the treatment of tuberculosis, to produce not only an immunity to toxins, but also a bacterial immunity, and felt that even in this disease he had seen evidence of an immunity of a degree sufficient to be of much value. He had observed, in acute miliary tuber-

* "Deutsche med. Wochenschrift," No. 14, 1897.

culosis, when the bacilli are distributed throughout the entire body, a stage during which the bacilli, formerly so numerous, disappear to such an extent that they can be found only with difficulty. It appeared, therefore, that even in these cases there was a sort of bacterial immunity. In the earlier of this series of experiments Koch endeavored to treat animals with entire bacilli, living or dead, introduced into the subcutis, the peritoneal cavity, or the circulation. But he found that he could not satisfactorily cause them to become absorbed, or that they produced disease or caused the death of the experimental animals. In addition to the original tuberculin the tuberculin A. (T.A.), tuberculin R. (T.R.), and tuberculin O. (T.O.) were produced. It was found that T.R., extracted from crushed bodies of tubercle bacilli, produced the highest degree of immunity of any tuberculin. In fact, he was able to satisfy himself that by repeated treatments with T.R. guinea-pigs could be protected against infection with virulent tubercle bacilli. Guinea-pigs that were infected before they were treated with T.R. showed some improvement.

This work was repeated in part by Stroebe*, who did not succeed in healing infected guinea-pigs, but he found that T.R. had the effect of influencing the disease and prolonging its course. Nor was he successful in immunizing guinea-pigs against tubercle bacilli.

Arloing, Courmont, and Nicolas† were equally unsuccessful in their investigations to test the action of T.R. upon animals infected experimentally.

Spengler‡ reported that he had found tuberculin to be capable of prolonging the life of infected guinea-pigs and to have a decided curative effect.

Hahn§ has reported some experiments to determine the curative effect of an extract from the bodies of crushed tubercle bacilli

* "Experiment. Untersuchungen," Jena, 1898.

† "Mém. de la Congr. de la Tuberc. à Paris," 1898.

‡ "Zeitschrift für Hygiene," Heft 2, 1898.

§ "Muench. med. Wochenschrift," No. 48, 1897.

prepared according to the method of Buchner. The experiments were made on guinea-pigs. Of twenty-three animals, of which six were controls, all were inoculated similarly with tubercle bacilli. The controls died in from one and one-half to four months; of the seventeen treated, three died within one and one-half months, five died within two to three and one-half months, four lived several months, and five appeared to recover, but had not been killed at the writing of the report.

Baumgarten* conducted an interesting experiment upon two rabbits which were inoculated into the anterior chamber of the eye with a culture of tubercle bacilli of low virulence. This produced disseminated tuberculous iritis. One of these rabbits was treated with tuberculin and the other was kept as a control. In both of them the iritis receded and appeared to heal, with scar-formation. However, after six months, the iritis returned in the control rabbit, and after nine months in the rabbit that had been treated with tuberculin. The control rabbit died about this time of an intercurrent infection. The rabbit that was treated with tuberculin appeared again to recover, and remained apparently well for a year, at the end of which time an acute tuberculosis of the eye occurred; the rabbit became emaciated and eventually died of miliary tuberculosis.

A large number of experiments to test the immunizing and curative effects of the various tuberculins were made upon rabbits before it was generally known that rabbits are comparatively immune to tubercle bacilli of human type. With our present knowledge as to the resistance of rabbits to human tubercle bacilli experiments made upon these animals for the purpose of testing the immunizing or curative value of a substance cannot be at all convincing unless the work is controlled by inoculations with tubercle bacilli of bovine type.

Injections of intact, dead tubercle bacilli have been made by

* "Arbeit. aus dem path. Inst. zu Tübingen," Heft 1, 1893.

Koch and others with the same object in view. Such injections appear, in some instances, unquestionably to confer a certain amount of resistance to the attacks of virulent tubercle bacilli, but the resistance has not been found to be great enough to make this mode of protection of practical utility.

Antitoxins found in the blood of animals that have been treated with various toxins or tuberculins have been used to a large extent experimentally for the purpose of immunizing animals against, and treating animals infected with, tuberculosis. Maragliano* was one of the first workers in this field. He obtained what he believed to be a curative serum by injecting toxins produced by or extracted from tubercle bacilli into experimental animals—*i. e.*, dogs, asses, and horses. Living tubercle bacilli were not administered to the animals that were to produce the serum. It was shown that a serum produced in this way had the ability to neutralize the toxic effect of tuberculin.

In 1899 Maragliano reported, at the Tuberculosis Congress in Berlin, that by means of his serum he was able to immunize rabbits and guinea-pigs against ordinarily fatal doses of tubercle culture. He announced then that his tuberculosis antitoxic serum was produced through methodical and progressive injections of tuberculosis toxins. The antitoxin was tested by determining its value for protecting guinea-pigs and rabbits against a fatal dose of tuberculosis toxin. The antitoxin serum was found to exert its protective action when it was administered up to six hours before the poison, or when it was administered at the same time as the poison. The toxic substance here referred to, which killed guinea-pigs and rabbits in from two to three days when administered intraperitoneally, consisted of dead tubercle bacilli from which the fat had been extracted, or aqueous or glycerin extracts of tubercle bacilli or of the active principles obtained from these extracts. It was also found that if the antitoxins were administered

* "Berlin. klin. Wochenschrift," No. 32, 1895.

with tuberculin to an infected animal, the occurrence of a febrile reaction, that without the antitoxin would surely occur, was prevented. He found the tuberculosis antitoxin to be quite harmless for man as well as for animals, and concluded that he was justified in claiming as a fact the production of a tuberculosis antitoxin that possessed the property of combating in the system the action of the tuberculosis toxin. He found that if guinea-pigs were inoculated intraperitoneally with virulent tubercle bacilli, and at the same time with antitoxic serum, fluid drawn from the peritoneal cavity twenty-four hours later contained bacilli, but that these were not virulent for other guinea-pigs. Guinea-pigs inoculated in this way—that is, with culture and antitoxin—were protected against acute intoxication, while control guinea-pigs receiving the same dose of culture died in two to three days. The guinea-pigs that had been inoculated with the culture and antitoxin together became emaciated and died within a month, but it was possible to save about 50 % of them by continuing intraperitoneally injections of antitoxin.

The excellent clinical results that are claimed for Maragliano's serum by numerous writers are not discussed here, as they do not come within the scope of this paper. So far as is known to the writer, Maragliano has made no experiments with the view of protecting cattle against tuberculosis by the use of his antitoxic serum, although he has claimed that, somewhat paradoxically, animals treated with this antitoxin develop more antitoxin.

Burnheim reported in 1894 on the use of an antituberculin serum made by immunizing animals to a filtered tuberculin toxin. Babes and Broco in 1896 reported on the use of a similar serum, and found that it had the effect of increasing, rather than retarding, the progress of tuberculosis in an already infected animal. Similar results were obtained by Ferran in 1897.

Niemann* endeavored to produce an antitoxic serum by treat-

* "Central. für Bacteriologic," p. 214, 1896.

ing animals with tuberculin and "mitigated" tubercle bacilli. He found that it was possible to produce artificial immunity against tuberculosis in dogs, cats, and guinea-pigs by repeated subcutaneous injections of tuberculin or of its active principles. The immunity so produced was proved by subcutaneous or intravenous inoculations with virulent tubercle bacilli. These inoculations failed to cause infection, as was shown by post-mortem examinations made some weeks or months later. He also found that it was possible to cause the development in the blood-serum of anti-tuberculin, either by treating the animal with tuberculin or by injections of mitigated tubercle bacilli. The development of the antitoxin appeared to be influenced favorably by injections of dead tubercle bacilli.

McFarland* produced "antituberculin" by treating an ass with increasing doses of tuberculin up to 150 c.c. The serum from the blood of the ass so treated was used in experiments on guinea-pigs, and therapeutic trials were also made on tuberculous persons. The work on guinea-pigs comprised experiments to determine the effect of the serum on healthy animals, on animals already inoculated with tuberculosis, and to determine its immunizing value and its ability to neutralize tuberculin or to counteract the effects of tuberculin administered to tuberculous guinea-pigs. It was shown that antituberculin was not injurious to healthy guinea-pigs, that it would not cure tuberculosis in guinea-pigs, and that it was not effective as an immunizing agent. It did, however, as shown by one set of experiments, appear to have the effect of counteracting the effects of tuberculin on tuberculous guinea-pigs. This effect was not clearly shown in a second series of experiments.

Patterson† endeavored to immunize rabbits and guinea-pigs by injections of dead cultures of avian tuberculosis and also by

* "Proceedings of the American Medical Association," section on Medicine, Philadelphia 1897.

† "The Lancet," October 30, 1897.

injections of the serum of fowls that had received large doses of dead avian tubercle bacilli. He found that by the use of this serum animals could be immunized to inoculation of tuberculosis to a small extent.

DeSchweinitz* produced an antituberculosis serum by treating animals with the toxic products of tubercle bacilli. An extract from tubercle bacilli was made by shaking them for several hours in distilled water. His serum-producing animals were treated for several months.

Von Behring, working in the same field, found that by the use of tuberculin toxins a specific antitoxin could be produced through the use of which the resistance of an animal to tuberculosis could be increased to a certain, but not to a large, extent.

The work that was done by all these investigators may be summed up by saying that it is well established that by the use of a tuberculosis toxin it is possible to immunize an animal against this toxin and to produce increased resistance to tuberculosis already existing, or to which an animal may subsequently be exposed. But the immunizing or curative results produced by toxins or by antitoxin resulting from the use of toxins, while sufficient to be definite and measurable, were not proved to be sufficient to be of much practical value so far as the protection of animals against tuberculosis is concerned. Evidently, the effect of their use was to produce a toxic but not a bacterial immunity. By means of these agents an animal may be shielded against the effects of the poisons of tuberculosis, and thus, to a certain extent, against the effects of the growth of tubercle bacilli. This appears to enable the resisting powers of the organism to come into play, and if the amount of infecting virus is not too great, or if the natural resisting power of the animal is large, it may be possible for sufficient immunity to result to protect the individual or for recovery to occur.

* "Tuberculosis Congress," Berlin, 1899.

It is, however, evident that immunity to be of much value must confer protection against the living organism as well as against its poisons. Progress in this line did not occur until efforts were made to immunize animals against living tubercle bacilli by the use of living tubercle bacilli. Dixon* in 1889 suggested that it might be possible to establish tolerance for the tubercle bacillus by treating animals with "tubercular material" from which tubercle bacilli had been removed by filtration, or that animals might be inoculated with bacilli the virulence of which had been diminished. He found that animals inoculated from an old culture containing club-shaped and branching forms of tubercle bacilli resisted subsequent inoculations with virulent tubercle bacilli. The experiments, the details of which are not furnished, were made on guinea-pigs, rabbits, and opossums. Efforts in this direction were made in 1891 by Grancher and Ledoux-Lebard, who endeavored to immunize rabbits against tuberculosis by making intravenous injections of avian tubercle bacilli and by Héricourt and Richet, who conducted similar experiments on dogs.

In 1892 and 1893 Trudeau "found that by subcutaneous preventive inoculation of living cultures of avian tubercle bacilli I was able to increase the resistance of a rabbit to infection of living virulent mammalian cultures." Trudeau† immunized rabbits to such an extent that when inoculated in the eye with "mammalian" cultures, the first inflammatory reaction gradually disappeared, leaving the eye in normal condition, while similar inoculations in control animals led to the destruction of the eye.

DeSchweinitz‡ in 1894 reported some experiments made by him on guinea-pigs, in which these animals were inoculated with tubercle bacilli of human origin, cultivated about twenty generations upon glycerin-beef broth of slightly acid reaction. This

* "Medical News," Philadelphia, October 19, 1889. "Medical and Surgical Reporter," Philadelphia, September 6, 1890.

† "New York Med. Journal," July 23, 1893.

‡ "Medical News," December 8, 1894.

culture of tubercle bacilli was not virulent for guinea-pigs, but it served to immunize guinea-pigs to such an extent that when they were afterward inoculated with tuberculous material from a cow, they remained healthy, while control animals inoculated with similar material died with tuberculosis in seven weeks. DeSchweinitz also injected very large quantities of human tubercle bacilli into cattle—subcutaneously, intravenously, and intraperitoneally. He found that by gradually increasing the dosage enormous quantities could be tolerated without injury.

McFadyean* has reported upon his experiments in relation to the immunization of cattle against tuberculosis. He inoculated four cattle intravenously with emulsions of tuberculous material and cultures from various sources. One of these cows, which had responded to the tuberculin test and was, no doubt, tuberculous upon the beginning of the experiment, was given about 150 c.c. of tuberculin in divided doses before inoculation. Fifteen weeks after inoculation with virulent tuberculous material this animal was killed and was found to contain but one tubercle, the size of a pea, and completely calcified, in a mesenteric gland. Two control cattle inoculated with an equal dose of the same material were killed April tenth and both were extensively tuberculous.

CASE I.

Yearling shorthorn heifer.

1899, Oct. 9: Tuberculin.	Maximum temperature,.... 106.0° F.		
Oct. 12: "	"	"	106.2°
Oct. 24: "	"	"	103.4°
Oct. 26: "	"	"	105.6°
Nov. 1: "	"	"	102.2°
Nov. 10: "	"	"	104.5°
Nov. 21: "	"	"	103.3°
Nov. 28: "	"	"	102.6°
Dec. 9: "	"	"	102.0°

* "Jour. Comp. Path. and Therap.," June, 1901, and March, 1902.

Dec. 22:	Tuberculin, 10 c.c.	Maximum temperature, ..	100.6° F.
Dec. 26:	" 10 c.c.	" "	102.0°
Dec. 28:	" 10 c.c.	" "	102.6°
1900, Jan. 1:	" 10 c.c.	" "	102.1°
Jan. 10:	" 20 c.c.	" "	102.3°
Jan. 13:	" 20 c.c.	" "	102.0°
Jan. 17:	" 20 c.c.	" "	102.0°
Jan. 21:	" 20 c.c.	" "	102.0°
Jan. 24:	" 20 c.c.	" "	101.0°
Feb. 6:	2 c.c. intravenously, heavy suspension of tuberculous tissue from mesenteric gland of horse.		
Feb. 14:	Tuberculin, 1 c.c.	Reaction.	
Feb. 17:	" 1 c.c.	"	
Feb. 24 to Mar. 28:	Repeated doses of tuberculin, 5 c.c to 20 c.c. No reaction.		
1900, May 22:	Killed.		

Necropsy.—In one mesenteric gland a completely calcified tubercle the size of a pea.

Of the other three cattle of the series, one (Case II) was tuberculous at the beginning of the experiment. All these were inoculated intravenously from seven to eleven times, during a period of from two to three years, with emulsions of tuberculous material and with cultures from various sources. It is interesting to note that the first inoculation upon each of the cows that was free from tuberculosis at the beginning of the experiment was made with avian material, which, no doubt, was of very low virulence for cattle. The cattle so inoculated died of tuberculosis after from two to more than three years from the beginning of the experiment, and in each case the chief lesions were in the kidneys and the brain or its covering membranes. The cerebral lesion appears to have been the immediate cause of death in each instance. There can be no doubt that these animals were remarkably resistant to tuberculosis, because they lived for some months and years after repeated inoculations with large quantities of material of proved virulence for cattle.

CASE II.

Ayrshire heifer.

1899, Oct. 9:	Tuberculin,	1 c.c.	Reaction.
Oct. 12:	"	1 c.c.	"
Nov. 27:	"	1 c.c.	Maximum temperature,... 103.0° F.
1900, Jan. 8:	"	1 c.c.	" " 106.0°
Jan. 11:	1.5 c.c., intravenously, heavy emulsion of tuberculous tissue from a rabbit inoculated from an ox.		
Jan. 15:	Tuberculin,	20 c.c.	No reaction.
Jan. 17:	"	20 c.c.	" "
Jan. 21:	"	20 c.c.	" "
Jan. 24:	"	20 c.c.	" "
Feb. 28:	"	20 c.c.	" "
Mar. 8:	"	20 c.c.	" "
Mar. 15:	"	10 c.c.	" "
Mar. 20:	"	10 c.c.	" "
Apr. 5:	2 c.c. intravenously, heavy emulsion of tuberculous tissue from rabbit inoculated from ox.		
June 13:	Tuberculin,	1 c.c.	Reaction.
July 18:	"	1 c.c.	"
Oct. 16:	"	1 c.c.	Maximum temperature,.. 105.4° F.
Nov. 20:	"	1 c.c.	No reaction.
Nov. 28:	2 c.c. intravenously, heavy emulsion of tuberculous tissue from horse (two drops of this emulsion administered intravenously to a rabbit killed it in four and one-half months).		
Dec. 19:	Tuberculin.	Maximum temperature,.. 105.0° F.	
1901, Jan. 22:	"	"	" 105.0°
Jan. 30:	5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture quite virulent for rabbit.		
May 15:	Tuberculin,	1 c.c.	Maximum temperature,.. 102.8° F.
1901, May 18:	5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture virulent for guinea-pigs.		
June 18:	Tuberculin,	1 c.c.	Maximum temperature,.. 103.0° F.
July 31:	5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture virulent for guinea-pigs.		
1901, Sept. 13:	Tuberculin.	Maximum temperature,.. 103.2° F.	
Oct. 22:	"	"	" 104.3°
Oct. 24:	10 c.c. intravenously, emulsion of tubercle bacilli from		

culture virulent for pony and moderately virulent for calf in dose of 2 c.c.

Nov. 11: Tuberculin. Maximum temperature,.... 102.2° F.

Nov. 29: " " " 105.8°

Dec. 17: Died suddenly.

Necropsy.—Condition good. Kidneys extensively tuberculous, pia mater at base of brain shows many small tubercles. Slight lesions also found in several lymphatic glands.

CASE III.

Hereford heifer.

1899, May 5: Tuberculin. No reaction.

May 10: 2.5 c.c. intravenously, emulsion of tuberculous tissue from pheasant.

May 11: Tuberculin. No reaction.

May 20: " " "

May 31: " Maximum temperature,.... 105.0° F.

June 13: " " " 105.6°

June 22: " " " 104.8°

June 29: " " " 105.0°

July 7: " " " 104.8°

July 15: " " " 104.0°

July 22: " " " 104.0°

July 28: " " " 103.8°

Aug. 4: " " " 104.0°

Aug. 11: " " " 104.6°

Aug. 18: " " " 103.3°

Aug. 25: " " " 103.4°

Sept. 1: " " " 103.0°

Sept. 8: " " " 103.8°

Sept. 16: " " " 103.6°

Sept. 24: " " " 103.4°

Oct. 26: " " " 102.0°

Nov. 11: 2.5 c.c. intravenously, emulsion of tuberculous tissue from rabbit that was inoculated from a horse.

1899, Nov. 21: Tuberculin. Maximum temperature,.... 102.0° F.

Nov. 28: " " " 103.4°

Dec. 9: " " " 102.0°

Dec. 22: " " " 102.0°

1900, Jan. 8: " " " 102.6°

CASE III.—(Continued.)

1900, Jan. 11:	1.5 c.c. intravenously, heavy emulsion of tuberculous tissue from a rabbit inoculated from an ox.	
Apr. 5:	3 c.c. intravenously, heavy emulsion of tuberculous tissue from rabbit inoculated from an ox.	
June 13:	Tuberculin.	Reaction.
July 18:	"	"
Oct. 16:	"	"
Nov. 20:	"	Maximum temperature,.. 101.8° F.
Nov. 8:	2 c.c. intravenously, heavy emulsion of tuberculous tissue from horse, moderately virulent for rabbit.	
Dec. 7:	Tuberculin.	Maximum temperature,.. 102.0° F.
Dec. 19:	"	No reaction.
1901, Jan. 2:	"	" "
Jan. 30:	5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture quite virulent for rabbit.	
Feb. 12:	Tuberculin.	Maximum temperature,.. 102.4° F.
Mar. 23:	15 c.c. suspension of tubercle bacilli from culture moderately virulent for rabbits.	
May 15:	Tuberculin.	Maximum temperature,.. 102.8° F.
May 18:	5 c.c. intravenously, heavy suspension of tubercle bacilli from culture virulent for guinea-pigs.	
June 18:	Tuberculin.	No reaction.
July 21:	5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture virulent for guinea-pigs.	
Sept. 13:	Tuberculin.	Maximum temperature,.. 104.6° F.
Oct. 5:	10 c.c. intravenously, suspension of tubercle bacilli of culture of low virulence for guinea-pigs.	
Oct. 22:	Tuberculin.	Maximum temperature,.. 103.8° F.
Oct. 24:	10 c.c. intravenously, emulsion of tubercle bacilli from culture virulent for pony and moderately virulent for calf in dose of 2 c.c.	
1901, Nov. 7:	Tuberculin.	Maximum temperature,.. 104.4° F.
Nov. 29:	"	" " 104.8°
Dec. 23:	Died suddenly.	

Necropsy.—Condition good. Kidneys show some small tubercles. Pia mater at base of brain shows many small tubercles which contain tubercle bacilli. A few lesions in lymphatic glands; in the lungs are some caseous and partly calcified masses of small size, but not uniformly distributed.

CASE IV.

Shorthorn cow.

- 1898, Sept. 19: Tuberculin. No reaction.
 Sept. 29: 4 c.c. intravenously, emulsion of tuberculous tissue from a fowl.
 Oct. 7: Tuberculin. Maximum temperature, 105.4° F.
 Oct. 17: " " " 105.4°
 Nov. 18: " " " 105.4°
 Dec. 15: " No reaction.
 1899, Nov. 11: 4 c.c. intravenously, emulsion of tuberculous tissue from a rabbit inoculated from a horse.
 1900, April 5: 3 c.c. intravenously, heavy emulsion of tuberculous tissue from rabbit inoculated from an ox.
 1901, Mar. 23: 15 c.c. intravenously, suspension of tubercle bacilli from culture moderately virulent for rabbit.
 May 18: 5 c.c. intravenously, heavy suspension of tubercle bacilli from culture virulent for guinea-pigs.
 July 30: 5 c.c. intravenously, heavy emulsion of tubercle bacilli from culture quite virulent for rabbit.
 Sept. 13: Tuberculin. Maximum temperature, 103.0° F.
 Oct. 5: 10 c.c. intravenously, suspension of tubercle bacilli from culture of low virulence for guinea-pigs.
 Oct. 10: Tuberculin. Maximum temperature, 102.4° F.
 Nov. 29: " " " 102.8°
 1902, Jan. 22: 4 c.c. intravenously, emulsion of tuberculous tissue from spleen of horse.
 Feb. 11: Died suddenly.

Necropsy.—Condition very good. Within the medulla oblongata there is a tuberculous area the size of a hazel-nut. Both kidneys tuberculous. A few lymphatic glands contain small caseous or calcareous areas. Some few tuberculous growths on pleura; few small, hard tubercles in lungs and ulcer on tongue.

McFadyean* concludes that—"It, therefore, appears to be justifiable to conclude that, whatever may have been the degree of natural immunity possessed by these three experimental cattle, it was much increased by the successive intravenous inoculations

* "Jour. Comp. Path. and Therap.," March, 1902, pp. 70, 71.

to which they were subjected. The immunity was not absolute, but it may be doubted whether a degree of resistance that will merit this term is obtainable by any method in cattle."

Von Behring announced December 12, 1901, that he was engaged in studying the immunization of cattle against tuberculosis, and he has since issued several reports upon his work. Von Behring has made a very large number of experiments in this field. He has endeavored to immunize animals against tuberculosis by the use of tuberculin, other tuberculosis toxins, by anti-toxins, by the use of dead tubercle bacilli, tubercle bacilli weakened by chemical agents, and by the use of living cultures of low virulence. Cattle treated by von Behring have been tested as to their resistance to tuberculosis by subcutaneous and intravenous inoculations with tuberculous material from cattle and with cultures of virulent tubercle bacilli of the bovine type. Some of the animals immunized by von Behring have been tested as to their resistance to tuberculosis by others. For this purpose, cattle have been sent from Marburg to Lorenz in Darmstadt, to Schlegel in Friburg, and to Eber in Dresden. The treatment to which these animals were subjected and the extent of their immunity will be referred to later.

Pearson and Gilliland* have published accounts of some experiments made by them upon the immunization of cattle against tuberculosis by the use of cultures of tubercle bacilli of human type. They report upon a yearling bull brought under experiment November 19, 1900, when he was inoculated intraperitoneally with tubercle bacilli obtained originally from human sputum. The same animal afterward received intravenous, subcutaneous, intraperitoneal, and intrapulmonal injections of tubercle bacilli of human type. In January, 1902, this bull was inoculated intraperitoneally with a suspension of a virulent culture of tubercle bacilli of bovine origin. The bull was kept eight months after this in-

* "Philadelphia Med. Jour.," November 29, 1902.

oculation and was fat and apparently healthy when killed. Lesions of tuberculosis were found, but these were neither extensive nor progressive. Three control cattle inoculated with smaller quantities of tubercle bacilli from the same culture that was used for the inoculation of this bull in January, 1902, died with tuberculosis. It is evident, therefore, that a high degree of immunity to tuberculosis had been conferred upon this bull by the preliminary treatment with tubercle bacilli of human type.

Yearling, grade shorthorn bull (26442).

Tested with tuberculin. No reaction.

1900, Nov. 19: 16 c.c. standard suspension (0.02 gm.) tubercle bacilli from human sputum, intraperitoneally.

1901, Mar. 17: 13.5 c.c. standard suspension (0.0175 gm.) of tubercle bacilli of human type, intravenously.

Aug. 23 to Jan. 10, 1902: Eighteen inoculations were given, intraperitoneally, intravenously, intrapulmonally, and subcutaneously, at intervals of from seven to ten days. In all, 1710 c.c. of standard suspension (2.22 gm.) of tubercle bacilli of human type were administered.

1902, Jan. 18: 10 c.c. standard suspension (0.013 gm.) tubercle bacilli of bovine origin and type, intraperitoneally.

Aug. 13: Killed.

Necropsy.—Condition good. Much fat upon carcass and about the viscera. Fibrinous coating, without tubercles, upon the pleura and peritoneum. Lymphatic glands about rectum enlarged and caseous. A few hard, small nodules in the lungs, which contained tubercle bacilli.

The checks upon this experiment (to show the virulence of the culture used for test inoculation January 18, 1902) were as follows:

Control cow (26431).

Tested with tuberculin. No reaction.

1901, Jan. 8: 5 c.c. standard suspension (0.0065 gm.) tubercle bacilli, bovine type, of same strain as used for inoculation of bull (26442) January 18, 1902.

Mar. 4: Dead.

Necropsy.—Extensive miliary tuberculosis.

Control cow (25433).

Tested with tuberculin.

No reaction.

1901, Jan. 18: Inoculated as cow above (26431) on same date.

Jan. 26: Dead.

Necropsy.—Acute miliary tuberculosis.

Control heifer, eight months old (45072).

Tested with tuberculin.

No reaction.

1902, Apr. 30: 5 c.c. standard suspension (0.0065 gm.), of bovine type, of same strain as used for inoculation of bull (26442) January 18, 1902, intraperitoneally.

June 7: Dead.

Necropsy.—Acute miliary tuberculosis.

The same authors, in the paper referred to above, report two other young cattle that received seven intravenous injections of from 10 to 25 c.c. of standard suspension (0.013 to 0.032 gm.) of tubercle bacilli of human type during a period of ten weeks. Eight weeks after the last injection of tubercle bacilli of human type the two vaccinated animals and also two unvaccinated controls were inoculated by injecting into the trachea 10 c.c. of a suspension (0.013 gm.) of tubercle bacilli of bovine type known to be virulent for cattle. These cattle were killed ten weeks later, when it was found that the vaccinated animals were entirely free from tuberculosis, while the unvaccinated animals were very extensively infected.

Vaccinated heifer, twelve months old (45068).

1902, Mar. 19: Tested with tuberculin.

No reaction.

Mar. 24: 10 c.c. suspension* tubercle bacilli, human type, intravenously.

Mar. 29: 15 c.c. suspension tubercle bacilli, human type, intravenously.

Apr. 3: 20 c.c. suspension tubercle bacilli, human type, intravenously.

Apr. 9: 15 c.c. suspension tubercle bacilli, human type, intravenously.

*1 c.c. suspension equals 0.0013 gm. dried tubercle bacilli.

Apr. 23: 20 c.c. suspension tubercle bacilli, human type, intravenously.

May 20: 20 c.c. suspension tubercle bacilli, human type, intravenously.

June 2: 25 c.c. suspension tubercle bacilli, human type, intravenously.

July 29: 10 c.c. suspension tubercle bacilli, bovine type, intratracheally.

Oct. 4: Killed.

Necropsy.—No evidence of tuberculosis. All organs normal.

Vaccinated bull, sixteen months old (45066).

1902, Mar. 19: Tested with tuberculin. No reaction.

Mar. 24: 10 c.c. suspension tubercle bacilli, human type, intravenously.

Mar. 29: 15 c.c. suspension tubercle bacilli, human type, intravenously.

Apr. 3: 20 c.c. suspension tubercle bacilli, human type, intravenously.

Apr. 9: 15 c.c. suspension tubercle bacilli, human type, intravenously.

Apr. 23: 20 c.c. suspension tubercle bacilli, human type, intravenously.

May 20: 20 c.c. suspension tubercle bacilli, human type, intravenously.

June 2: 25 c.c. suspension tubercle bacilli, human type, intravenously.

July 29: 10 c.c. suspension tubercle bacilli, bovine type, intratracheally.

Oct. 16: Killed.

Necropsy.—No evidence of tuberculosis. All organs normal.

Control heifer, eleven months old (45071).

1902, Mar. 19: Tested with tuberculin. No reaction.

July 29: 10 c.c. suspension tubercle bacilli, bovine type, intratracheally, as used upon 45066 and 45068.

Oct. 8: Killed.

Necropsy.—Lesions of tuberculosis were found in the trachea, in the lymphatic glands of the throat, and in the lungs. The bronchial and mediastinal lymphatic glands were also tuberculous.

Control heifer, fifteen months old (45067).

1902, Mar. 19: Tested with tuberculin. No reaction.

July 29: 10 c.c. suspension tubercle bacilli, bovine type, intratracheally, as used upon 45066 and 45068.

Oct. 16: Killed.

Necropsy.—Lesions of tuberculosis were found in the trachea, in the lymphatic glands of the throat and neck, and in the lungs. The bronchial and mediastinal lymphatic glands were also tuberculous.

The authors referred to conclude:

1. "That after repeated intravenous injections of cultures of tubercle bacilli from human sputum the resistance of young cattle to virulent tubercle bacilli of bovine origin may be increased to such an extent that they are not injured by inoculation with quantities of such cultures that are capable of causing death or extensive infection of cattle not similarly protected.

2. "That intravenous injections of much larger quantities of culture of human sputum tubercle bacilli than are necessary to confer a high degree of resistance, or immunity, upon the vaccinated animals, may be administered without danger to that animal."

Thomassen* has reported upon a few experiments upon the immunization of cattle against tuberculosis. He found that young cattle that had received intravenous injections of tubercle bacilli of human type were more resistant to tubercle bacilli of bovine type than animals not so treated. He showed that even one inoculation with human tubercle bacilli sufficed to add perceptibly to the animal's resistance, but not to protect it from infection. He did not, however, make systematic efforts to produce a high degree of immunity.

Neufeld† carried on, in Koch's institute in Berlin, an exten-

* "Recueil de Med. Vet.," January 15, 1903.

† "Deutsch. med. Wochenschrift," September 10, 1902. "Deutsch. med. Wochenschrift," April 28, 1904.

sive series of experiments upon the production of immunity by the use of living tubercle bacilli of low virulence. Neufeld ascertained by prolonged experimentation that it was not possible to obtain immunity in experimental animals by the use of toxins or dead tubercle bacilli. In his experiments he followed the plan of making preliminary injections of tuberculin or of dead tubercle bacilli, after which increasing doses of living cultures were used. He started with cultures of low virulence and of human type; following this he used cultures of bovine type. The experiments were made on goats, donkeys, and cattle. He found that after making a number of intravenous injections of living cultures that a limit of tolerance was soon reached, and that this limit was due not to the infecting action of the organism, but rather to its toxic effect. He holds that the extent to which an animal may be immunized is determined by the amount of toxin that it can endure or to which it may become accustomed. The toxic effect of the cultures administered was confined to the animals that had previously been treated with cultures. A fatal intoxication could occur within twenty-four hours after the administration of suspensions of tubercle bacilli. Such acute intoxication following the use of living tubercle bacilli occurred in all the species of animals used in these experiments.

A few protocols are given in Neufeld's paper. These show that he was successful in some instances in producing a high degree of immunity to tubercle bacilli of bovine type by a very short process. For example, goat No. 26 received January 9, 1902, 0.025 gm. pulverized dead tubercle bacilli intravenously; January 17th, 0.0025 gm. human tubercle bacilli intravenously; January 28th, 0.01 gm. bovine tubercle bacilli intravenously. The goat died on March 18th of acute poisoning following the intravenous injection of 0.02 gm. bovine tubercle bacilli. In the lungs there were numerous small, hard nodules, evidently receding tubercles resulting from the previous injections. In this animal the entire course of treatment occupied but nine-

teen days, and it appears that one dose of living human tubercle bacilli proved to be sufficient to protect the animal against a quantity of virulent bovine culture four times as great, and sufficient to kill control animals within from three to four weeks.

Some of the animals immunized by Neufeld, as donkeys Nos. 3, 6, and 7, after having been treated with several intravenous injections of tubercle bacilli of human type, were proved to be exceedingly resistant to repeated large doses of tubercle bacilli of bovine type. The doses of bovine culture were in some instances four times as great as were required to kill an unprotected animal within two months.

Neufeld calls particular attention to the fact that it is possible to overvaccinate, especially in goats, and thus to place the result of the immunization in question. Too large doses of human tubercle bacilli (30 to 60 mg. given at several times) resulted in the production of a little, but not an effective, degree of immunity.

No protocols are given in relation to cattle, but it is stated that the experiments that have been made upon cattle have given in general the same results as those made upon donkeys and goats. Cattle were treated with different series of tubercle bacilli of human type and with tubercle bacilli of bovine type that had lost their virulence for cattle. It was customary to precede the injections of living organisms with injections of pulverized bacilli.

These experiments show that it is possible to immunize goats, donkeys, and cattle by intravenous injections of living tubercle bacilli of human type against fatal doses of virulent bacilli of bovine type. Neufeld's researches also show that it is not possible to obtain similar results with dead organisms.

Friedmann* reported in 1903 upon immunization against tuberculosis. He obtained a culture of tubercle bacilli from a turtle and found that, by treating guinea-pigs with this culture, he was able to confer upon them a considerable degree of re-

* "Deutsch. med. Wochenschrift," No. 26, 1903.

sistance to mammalian tubercle bacilli. The culture from the cold-blooded animal was not virulent for dogs, rats, mice, rabbits, or guinea-pigs, excepting when used in very large doses. Even then, the local infection that was produced resulted uniformly in the production of passing lesions, from which the animal wholly recovered. When guinea-pigs treated with this culture were subsequently inoculated subcutaneously with tubercle bacilli of human type, there resulted at the point of inoculation a soft swelling, the interior of which sometimes broke down in a caseopurulent mass which discharged through the skin and terminated in such complete recovery that it was difficult or impossible to find the seat of inoculation. When such guinea-pigs were killed three months after the inoculation, it was found that they were in a good state of nutrition and that their internal organs were usually of normal appearance. In some, however, it was possible, on close examination, to find sometimes a few, and sometimes many, small, gray points that at first looked like tubercles, but microscopic examination showed that these points were made up of large numbers of round-cells, with here and there a giant-cell. Tubercle bacilli were never found in these lesions. Friedmann does not consider the occurrence of these lesions to be evidence of tuberculous infection, for he remarks that they are similar in nature to those described by Koch and Schuetz as occurring in cattle when inoculated with tubercle bacilli of human type, against which they are immune. He also considers them to be identical with nodules that are found after inoculation with non-pathogenic saprophytes or neutral foreign bodies, as fragments of hair, etc.

Friedmann also found that it was possible to immunize turtles against their tubercle bacilli by treating them with mammalian tubercle bacilli. He reports that he has in progress similar experiments upon goats and cattle.* He claims that cattle

* "Deutsch. med. Wochenschrift," No. 46, 1904.

are not injured by intravenous injections of large quantities of the turtle tubercle bacillus, and after they have been treated in this way they are protected against infection from "mammalian" tuberculosis. He is now engaged in experiments in which he is endeavoring to increase the immunity of cattle that have been first treated with turtle culture by subsequently treating them with more virulent cultures. In this way he hopes, gradually, to raise the resistance of cattle to a point high enough to confer upon them protection against epidemiological tuberculosis.

It would appear, from this, that Friedmann is not satisfied that a practical degree of immunity can be obtained by the use of the turtle tubercle bacilli alone, and that he finds it necessary, after animals have been given "foundation immunity" by the use of this culture, to endeavor to increase their immunity by the use of cultures that are more virulent.

Some new work of Weber and Taute* tends to show that acid-resisting bacilli, closely resembling tubercle bacilli, may be found in cold-blooded animals in quantity, and that it is not proved that a true tubercle bacillus occurs in such animals.

Investigations by von Behring and his associates were referred to above in chronological sequence, by reference to his first announcement in relation to the immunization of cattle by the use of living cultures of tubercle bacilli of human type. The experiments of von Behring have been conducted on a large scale and are discussed in a number of papers. His method has also been employed by other investigators, who have reported upon their work, so that the literature on this phase of the immunization of cattle is becoming somewhat voluminous.

Von Behring's first announcement of this subject was made at the Academy of Science of Stockholm, December 12, 1901, upon the occasion of conferring the Nobel prize. In this announcement the claim was made that a method had been found

* "Deutsch. med. Wochenschrift," No. 28, 1904.

whereby it was possible to vaccinate cattle successfully against tuberculosis. The principles upon which such protection was based were briefly stated. The detailed report of von Behring's* early work in this field appeared during the following year, and has since been followed by several other reports.†

Von Behring's first report on this subject is made in association with Römer and Ruppel. Some of the later reports are issued by Römer. The first contains a description of the cultures of tubercle bacilli studied in von Behring's institute, protocols showing the treatments that various animals received, and a general discussion of the subject of immunization against tuberculosis.

It is stated that the publication is made for the purpose of making it possible for the reader to form his own opinion as to the scientific foundation for the Marburg plan for combating tuberculosis of cattle, and it is here reviewed at length for the same reason. It was then planned, in coöperation with official veterinarians, to make practical tests on farms for the purpose of determining whether, by a simple and cheap method, it would be possible to protect cattle from infection. Von Behring was led to the hope that this would be possible, because he had observed that two or even one inoculation with tubercle bacilli of low virulence served to diminish the susceptibility of cattle to subsequent inoculations.

In chapter two of the report under consideration a number of protocols are given of animals repeatedly inoculated with tuberculosis virus and tuberculosis toxins of various kinds. The method pursued in the treatment of these cattle was not the same as the method recommended for practical use. For such use it was advised that one should first administer 0.001 gm. of tubercle bacilli of human type from a four to six-weeks'-

* "Beiträge zur experimentellen Therapie," Heft 5, Marburg, 1902.

† *Loc. cit.*, Hefte No. 6, 7, 8, 9, 10.

old serum culture, of a special race designated as No. 1. Four weeks later the same animal was to be vaccinated a second time with similar material, but with twenty-five times the original quantity, namely, 0.025 gm. Immunization was recommended for cattle from five to seven months old, that had been tested with tuberculin but did not react. It was considered that this system of vaccination was but provisional, and that it might be found to be advisable to precede the first vaccination by a vaccination with a less virulent organism or dead tubercle bacilli, or, on the other hand, that it might be found to be desirable to strengthen the second dose. These questions were to be solved by future investigations. *No experimental proof of the efficacy of the proposed system was furnished at the time it was advanced.*

The process of vaccination against tuberculosis, as worked out by von Behring, was by him termed "Jennerization." A considerable part of von Behring's report is made up of a statement of facts in regard to the various cultures of tubercle bacilli that have been studied in his laboratory, and whose virulence for animals of various kinds has been tested. Attention is drawn to the fact that it was not until 1901 that a culture of tubercle bacilli was available at the Marburg laboratory that was distinctly virulent for cattle. Until 1901 the culture that was worked with, chiefly, was one obtained from human sputum in 1895.

This culture (No. 1) was fatal for guinea-pigs in seven to eight weeks when administered subcutaneously in a dose of 0.01 gm. The same dose, similarly administered to a rabbit, caused but a slight illness, but when administered intravenously, caused death in from sixteen to eighteen days. Of this culture, 0.001 gm. administered intravenously to rabbits caused death in eight weeks. In cattle, 0.01 gm. intravenously produced a passing reaction or a moderate degree of illness, soon followed by recovery. This culture is not altogether harmless for cattle, for a large dose (0.05 gm.) administered intravenously causes grave illness.

Even a dose of 0.01 gm. intravenously may cause a high fever lasting almost three weeks. The virulence of this organism is less in old cultures and when it has been warmed and dried in a vacuum. These facts in relation to von Behring's culture No. 1 are furnished because this is the culture now used for his vaccinations.

In the second chapter of the same report instructions are given for the use of tuberculin in the diagnosis of tuberculosis of cattle. The tuberculin is used in the usual way, excepting in relation to the taking of temperatures. It is advised that the first temperature shall be taken shortly before the administration of tuberculin, the second eight to twelve hours later, and the third twenty-four hours after the injection. If, at the last measurement, the temperature has not returned to near the original temperature, measurements must be continued at intervals of twelve hours until the temperature is again normal. This method of applying the tuberculin test is quite different from that recommended by the great authorities on this question, as Bang, Nocard, Hutyra, Eber, etc. In the practical work of testing cattle one would fail absolutely to find a large proportion of infected animals if so few temperature measurements were made as are recommended by von Behring.

The cattle that are especially reported on in this number (5) of the "Beiträge zur experimentellen Therapie" are Nos. 8, 9, 10, 11, 16, 17, and 20. It is claimed that the protocols and temperature-records that are furnished in relation to these cattle answer the two following questions: First, does this report furnish experimental proof that cattle may, at will, be placed in such a condition of immunity to tuberculosis that they can withstand an inoculation with tuberculosis virus that is fatal for control animals? Second, are tubercle bacilli from man under all conditions innocuous for cattle, or is it possible to show that they may cause tuberculous lesions in cattle, and, if so, is there an essential difference in these lesions from those produced by

bovine tubercle bacilli? With the view of obtaining evidence leading to an answer to the first question reference is made to the protocol of animal No. 8:

Cow No. 8.

- 1901, July 4: 0.1 c.c. tuberculin subcutaneously.
July 12: 0.1 gm. attenuated tubercle bacilli intravenously (Arloing).
Sept. 4: 0.001 gm. human tubercle bacilli intravenously.
Sept. 19: 0.1 c.c. tuberculin subcutaneously.
Sept. 30: 0.2 c.c. tuberculin subcutaneously.
Oct. 5: 0.01 gm. bovine tuberculous culture intravenously.
Oct. 14: 0.1 c.c. tuberculin subcutaneously.
Oct. 16: 0.05 gm. tuberculous material intravenously, from guinea-pig inoculated with bovine culture.
Nov. 15: 0.1 c.c. tuberculin subcutaneously.
Nov. 17: 0.05 gm. culture human tubercle bacilli intravenously.
Nov. 28: 0.1 gm. human tubercle bacilli intravenously.
Nov. 30: 0.2 gm. human tubercle bacilli intravenously.
Dec. 2: 0.4 gm. human tubercle bacilli intravenously.
Dec. 9: 0.05 gm. caseous material intravenously.
1902, Jan. 8: 0.02 c.c. tuberculin subcutaneously.
Jan. 16: 0.025 gm. bovine culture intravenously.

It is pointed out that on January 16, 1902, this cow was inoculated intravenously with 0.025 gm. of a serum culture of bovine tubercle bacilli, twenty days old. The same inoculation was made upon treated cow No. 16 and upon control cow No. 43. No. 43 developed tuberculosis as a result of this inoculation and died of miliary tuberculosis February 14, 1902, while the previously treated animals, Nos. 8 and 16, came through alive; indeed, No. 8 showed merely a fever of short duration and a little loss of weight, while No. 16 had a more severe fever, coughed, and presented the clinical signs of inflammation of the lungs.

Cow No. 16 was brought under experiment in September, 1901. She was tested with tuberculin without reaction and was treated as follows:

- 1901, Sept. 24: Tuberculin tested.
 Sept. 26: 0.0175 gm. bovine tubercle bacilli intravenously.
 Oct. 14: Tuberculin.
 Nov. 21: Tuberculin.
 Nov. 26: 0.0001 gm. human tubercle bacilli intravenously.
 Nov. 28: 0.00025 gm. human tubercle bacilli intravenously.
 Nov. 30: 0.019 gm. dried and ground tubercle bacilli with iodoform subcutaneously.
 1902, Jan. 8: Tuberculin.
 Jan. 16: 0.025 gm. bovine tubercle bacilli intravenously.
 Mar. 19: Killed.

Necropsy.—The lungs contained numerous nodules from the size of a pin-head to the size of a cherry-stone. These were both immediately beneath the pleura and scattered through the lung tissue. The larger nodules contained caseous material that was encapsulated in a reddish gray and dense connective-tissue wall. The smaller nodules consisted entirely of dense connective tissue; all the smaller nodules appeared to be approximately of the same size. The bronchial and other lymphatic glands were normal. Tubercle bacilli were not found in the contents of the nodules of the lungs upon microscopic examination. Guinea-pigs were inoculated with this material. It is assumed that the tubercles in the lungs could not have resulted from intravenous inoculation of bovine tubercle bacilli on January 16th, because they appeared to show more age than would be shown by infection resulting at that time; therefore they are referred to the intravenous injection of tubercle bacilli made on September 26th.

Undoubtedly, the resistance of this cow to tuberculosis had been increased by the treatment she had received. It will be observed, however, that this animal had not been treated with tubercle bacilli of human type alone—that she was first inoculated with bovine tubercle bacilli, then twice with human tubercle bacilli, and once with dried and ground tubercle bacilli with iodoform, and that there were intervals of but two days between the last-mentioned treatments. Moreover, it was found, on postmortem examination of this cow, that there were in the lungs numerous tuberculous nodules of two sizes. Notwithstanding that these nodules are of two sizes, or classes, it is assumed that all these lesions date from the first inoculation. It is

extremely difficult to determine the age of a tuberculous lesion; the best authorities may differ on this point, and so the estimate that is made in this case cannot be regarded as convincing. Cow No. 8 was killed in October, 1902, and is reported on, very briefly, by Römer.* There were some nodules in the lungs which were well encapsulated. Whether tubercle bacilli were found in these nodules, and, if so, whether they were living and virulent, is not stated.

Cow No. 10 is also referred to in extenso. The protocol for this cow follows:

Cow No. 10.

- 1901, July 5: 5 c.c. tuberculin subcutaneously.
July 20: 0.01 gm. bovine tubercle bacilli subcutaneously.
Sept. 14: 0.1 c.c. tuberculin subcutaneously.
Oct. 3: 0.2 c.c. tuberculin subcutaneously.
Oct. 16: 0.05 gm. tuberculous material from guinea-pig subcutaneously.
Nov. 16: 0.02 c.c. tuberculin subcutaneously.
Nov. 21: 0.2 c.c. tuberculin subcutaneously.
Nov. 28: 0.001 gm. human tubercle bacilli intravenously.
Dec. 3: 0.001 gm. human tubercle bacilli intravenously.
Dec. 8: 0.002 gm. human tubercle bacilli intravenously.
Dec. 11: 0.004 gm. human tubercle bacilli intravenously.
Dec. 14: 0.008 gm. human tubercle bacilli intravenously.
Dec. 19: 0.015 gm. human tubercle bacilli intravenously.
Dec. 21: 0.03 gm. human tubercle bacilli intravenously.
1902, Jan. 8: 0.2 c.c. tuberculin subcutaneously.
Jan. 13: 0.025 gm. bovine tubercle bacilli intravenously.
Feb. 13: 0.02 gm. bovine tubercle bacilli subcutaneously.

It will be seen that this cow was inoculated January 13th with bovine tubercle bacilli. A control animal (No. 42), similarly inoculated at the same time, died of miliary tuberculosis in twenty-six days. The effect on No. 10 was to produce moderate fever and considerable loss of weight. In other comparative

* "Beiträge zur experimentellen Therapie," Heft 7, 1904.

tests this animal showed itself to be notably more resistant to inoculation with virulent bovine tuberculosis virus than were untreated controls. This animal was killed in September, 1902, and is reported upon by Römer.* The necropsy showed rather extensive alterations and especially numerous tuberculous nodules in the lungs.

A high degree of immunity is claimed for cow No. 11.

Cow No. 11.

- 1901, Aug. 0.2 c.c. tuberculin subcutaneously.
- Aug. 21: Tuberculous tissue from a cow subcutaneously.
- Sept. 9: 0.001 gm. attenuated tubercle bacilli (Arloing) intravenously.
- Sept. 16: 0.128 gm. iodoform intravenously.
- Sept. 19: 0.1 c.c. tuberculin subcutaneously.
- Oct. 3: 0.2 c.c. tuberculin subcutaneously.
- Nov. 5: 5.0 c.c. 2 % iodid of potash subcutaneously.
- Nov. 8: 0.1 gm. iodid of potash intravenously.
- Nov. 10: 0.143 gm. iodoform intravenously.
- Nov. 15: 0.2 c.c. tuberculin subcutaneously.
- Nov. 22: 0.005 gm. human tubercle bacilli intravenously.
- Nov. 28: 0.01 gm. human tubercle bacilli intravenously.
- Nov. 30: 0.0145 gm. dried bovine tubercle bacilli intravenously.
- 1902, Jan. 8: 0.2 c.c. tuberculin subcutaneously.
- Jan. 13: 0.025 gm. human tubercle bacilli intravenously.
- Feb. 17: 0.0001 gm. bovine tubercle bacilli intra-ocularly.

This animal was inoculated intra-ocularly February 17, 1902, with a dose and culture that always destroyed the eye of unvaccinated cattle. January 13th it was inoculated with a culture of human tubercle bacilli (No. 3) intensified by passage through a goat, so that it was more virulent than culture No. 1 and produced in a control (No. 40) a more severe reaction than in animal No. 11. However, it is not shown that this culture was capable of producing lesions of tuberculosis in a control. November 30, 1901, this cow was inoculated with bovine tubercle

* *Loc. cit.*, Heft 7, p. 98.

bacilli reduced in virulence by drying. No control experiment was made to show the effect of this same material when administered intravenously to an unvaccinated animal. This cow was killed in January, 1903, and was found to be free from tuberculosis. On the left lung there were connective-tissue growths, but these were free from tubercle bacilli.

Animal No. 17 is also referred to as having a remarkable degree of resistance, as shown by the fact that when inoculated January 31, 1902, with 0.0025 gm. tubercle bacilli, it withstood the inoculation without loss of weight and with a fever of short duration, while a control animal (No. 45), similarly inoculated, died of miliary tuberculosis February 20th.

Cow No. 17.

- 1901, Sept. 20: 0.1 c.c. tuberculin subcutaneously.
- Sept. 20: 0.2 c.c. tuberculin subcutaneously.
- Oct. 11: 0.01 gm. dried tuberculous tissue from ox subcutaneously.
- Nov. 22: 0.05 c.c. tuberculin subcutaneously.
- Nov. 26: 0.0001 gm. human tubercle bacilli intravenously.
- Nov. 28: 0.00025 gm. human tubercle bacilli intravenously.
- Dec. 2: 0.0005 gm. human tubercle bacilli intravenously.
- Dec. 11: 0.001 gm. human tubercle bacilli intravenously.
- Dec. 19: 0.02 gm. human tubercle bacilli intravenously.
- Dec. 21: 0.004 gm. human tubercle bacilli intravenously.
- 1902, Jan. 8: 0.2 c.c. tuberculin subcutaneously.
- Jan. 28: 0.2 c.c. tuberculin subcutaneously.
- Jan. 31: 0.0025 gm. bovine tubercle bacilli intravenously.

This cow was killed in August, 1902. Quite extensive lesions of tuberculosis were found, but a full statement as to the condition of this animal on post-mortem examination is, unfortunately, not given. It is stated that the lesions that were found in this cow were due to the inoculation of October 11, 1901, and not to the inoculation of January 31, 1902. It is, however,

* *Loc. cit.*, Heft 7.

doubtful whether from an examination of the lesions themselves it is possible to show that this is the case.

Cow No. 20.

- 1901, Oct. 3: 0.2 c.c. tuberculin subcutaneously.
- Oct. 16: 0.05 gm. tubercular tissue subcutaneously.
- Nov. 22: 0.05 c.c. tuberculin subcutaneously.
- 1902, Jan. 8: 0.05 c.c. tuberculin subcutaneously.
- Jan. 15: 0.05 c.c. tuberculin subcutaneously.
- Jan. 28: 0.2 c.c. tuberculin subcutaneously.
- Jan. 31: 0.0025 gm. bovine tubercle bacilli intravenously.

This cow was killed in November, 1902.* In the lungs there were numerous nodules, some of them fibrous or calcareous.

Eber has reported † on two cattle immunized in Marburg, and then sent to him in Leipsic so that their immunity might be tested in comparison with animals not vaccinated. One of the Marburg cattle used in this experiment was cow No. 9.

Cow No. 9.

- 1901, July 6: 5 c.c. tuberculin subcutaneously.
- July 17: 0.1 gm. attenuated bovine tubercle bacilli intravenously.
- Sept. 14: 0.2 c.c. tuberculin subcutaneously.
- Oct. 3: 0.2 c.c. tuberculin subcutaneously.
- Oct. 5: 0.01 gm. dried and powdered bovine tubercle bacilli intracocularly.
- Oct. 29: 0.001 gm. human tubercle bacilli intravenously.
- Nov. 28: 0.0001 gm. human tubercle bacilli intravenously.
- Nov. 30: 0.00025 gm. human tubercle bacilli intravenously.
- Dec. 2: 0.0005 gm. human tubercle bacilli intravenously.
- Dec. 19: 0.001 gm. human tubercle bacilli intravenously.
- Dec. 21: 0.002 gm. human tubercle bacilli intravenously.
- 1902, Jan. 3: 0.05 c.c. tuberculin subcutaneously.
- Jan. 28: 0.2 c.c. tuberculin subcutaneously.
- Feb. 18: 0.5 c.c. tuberculin subcutaneously.

* *Loc. cit.*, Heft 7.

† "Berliner thierärztliche Wochenschrift," 1904, No. 53.

The other cow in Eber's experiment was No. 46, which was treated by intravenous injections of dead human tubercle bacilli from a rat, with fresh human tubercle bacilli, and afterward with intravenous inoculations of fresh bovine tubercle bacilli, and, finally, with two intravenous injections of dried avian tubercle bacilli.

These animals were inoculated five times with tuberculous material from cattle or with pure cultures of bovine tubercle bacilli. Both subcutaneous and intravenous inoculations were made. For each inoculation of the vaccinated animals parallel inoculations of unvaccinated animals were made. The subcutaneous inoculations of the unvaccinated animals resulted in each case in a local infection, and in two cases the infection had extended beyond the seat of inoculation and the collateral lymphatic glands to the lungs, where a few small fresh lesions were found. In another case embolic tubercles were found in the lungs, liver, and spleen. In each of the vaccinated animals the subcutaneous inoculations produced a local reaction that resulted in some instances in abscess formation. In nearly all cases the local lesion disappeared. Two inoculations, however, left small encapsulated masses of caseous material containing living tubercle bacilli when the cows were killed.

The intravenous inoculations of the two unvaccinated controls with 0.01 gm. bovine tubercle bacilli caused death in one case in twenty-eight and in the other case in thirty-eight days. Both animals were afflicted with acute miliary tuberculosis. A similar inoculation applied to cow No. 9 produced a febrile reaction which disappeared in ten days. Five and three-quarter months after this inoculation convulsions occurred, and on this account the cow was killed. Lesions of tuberculosis were found in considerable numbers in the lungs and in both kidneys. These were approximately the size of a pea and were caseous. Numerous tubercle bacilli were found in the tubercles of the lungs; bacilli were more scanty in the tubercles in the kidneys. There

was also a basilar meningeal tuberculosis. There were three tuberculous areas in the mesenteric lymphatic glands.*

Cow No. 46 was inoculated subcutaneously three times with material of proved virulence for control animals. Upon slaughter it presented lesions of tuberculosis beneath the skin and an embolic tubercle, the size of a pea, in the left kidney. The latter lesion was surrounded by numerous small miliary tubercles. It was found that the kidney lesions contained living, virulent tubercle bacilli.

From his numerous careful observations on these two cattle treated in Marburg, and upon his controls, Eber draws certain conclusions which may be summarized as follows: That both of the Marburg cattle had more resistance to tuberculosis than untreated animals, but that their resistance was not absolute. That since these cattle were not treated as von Behring now recommends, the results of experiments upon them do not determine the value of his present method. That tuberculin is not a reliable diagnostic agent as applied to animals that have been treated with attenuated bovine or with human tubercle bacilli.

Eber, so late as the publication of his paper, December 20, 1904, regarded as unsettled, and not capable of being settled for years, the question as to the value of von Behring's two-vaccination method for immunizing young cattle. He considers it necessary to make a large number of painstaking observations on vaccinated and unvaccinated animals, and to amplify the observations made during life by examinations of the slaughtered animals. Such observations are already under way.

Schlegel† experimented with two cattle immunized at Marburg. Heifer No. 14, eighteen months old, had as its first treatment an intravenous injection of dead tubercle bacilli of low virulence (Arloing); this was followed after one week by an intravenous

* It is interesting to compare the lesions found in this cow with those found in McFadyen's vaccinated cattle.

† "Berliner thierärztliche Wochenschrift," 1903, No. 49.

inoculation with an emulsion of a piece of spleen from a guinea-pig that had been inoculated with bovine tuberculosis. Afterward this animal had a number of intravenous injections of human tubercle bacilli. Eight doses were given in quick succession between November 23d and December 23d. The dosage ranged from 0.005 gm. to 0.4 gm., and afterward the animal was repeatedly tested with tuberculin. The other animal, a young steer, No. 40, was treated as follows:

1901, Dec. 21: 0.25 c.c. tuberculin subcutaneously.

1902, Jan. 13: 0.025 gm. tubercle bacilli of human origin, rendered more virulent by passage through goat and ox, intravenously.

May 27: 0.25 c.c. tuberculin subcutaneously.

May 29: 0.02 gm. human tubercle bacilli intravenously.

June 9: 0.05 gm. human tubercle bacilli intravenously.

When these two cattle were placed under Professor Schlegel's care in February, 1903, they were treated with tuberculin, and both reacted strongly to the test. By way of testing the immunity of these two animals each was given 0.033 gm. of bovine tuberculous material from an infected lymphatic gland of a cow. This material was administered intravenously. At the same time a control (I) was similarly inoculated. None of the three animals appeared to have been injured seriously by this inoculation. Two additional controls (II and III) were acquired. All five animals (the two Marburg cattle, the original control once inoculated, and the two new controls) were inoculated intravenously with 0.0005 gm. dried tubercle bacilli of bovine type. This inoculation caused only a passing febrile reaction in both of the immunized cattle and also in one of the (II) new pair of controls. The first (I) control and one of the new pair (III) reacted excessively to this inoculation, and their temperatures remained high for eight to nine weeks. During this time one of the Marburg cattle (No. 14) lost weight rather rapidly, stopped eating, and became emaciated. The Marburg steer (No. 40)

was living at the time the report was made, but the other cattle had been killed. The Marburg cow (No. 14) was found to be afflicted with generalized embolic tuberculosis of moderate grade. There were fibrous lesions upon the pulmonary pleura and *fresh lesions* in the mediastinal glands and in the kidneys.* "The capsule of the spleen is fibrous and thickened; tubercle bacilli not found. Upon the lower parts of the pleural surfaces there are flat fibrous growths; tubercle bacilli not found; in some places pedunculated calcareous or wart-like excrescences were seen, in which tubercle bacilli were not found. In the lower border of the lung there were four subpleural, lentil-sized, grayish-yellow nodules which are not caseous and which contain tubercle bacilli. Mediastinal lymphatic glands enlarged and contain some yellow nodules of pin-head size containing tubercle bacilli. The right kidney somewhat enlarged, and beneath cortex are some small lesions containing tubercle bacilli."

One of the controls (I) showed the lesions of generalized embolic tuberculosis of rather extensive degree. Lesions of two classes were found, apparently arising from each inoculation. Another control (II) showed moderate lesions at the point of inoculation and in the collateral lymphatic glands. There were some small, old lesions of tuberculosis upon the pleura and in the right lung. The postpharyngeal mediastinal glands were tuberculous. In the third control (III) lesions of tuberculosis were found at the point of inoculation and in the collateral lymphatic glands. The internal organs were free from lesions of tuberculosis. Schlegel's report shows that the Marburg vaccinated cow that was killed contained a number of lesions of tuberculosis. This cow was evidently very seriously infected by the first inoculation and reinfected by a later inoculation. These post-mortems show that the vaccinated cow was more extensively tuberculous than two of the controls. Schlegel concludes

* "Berliner thierärztliche Wochenschrift," No. 49, 1903.

that immunization against tuberculosis promises to give good results, but that it is necessary to solve a number of questions before it can be put to practical use.

Lorenz* has reported on cattle immunized in Marburg that were sent to him in Darmstadt, so that their immunity against tuberculosis might be tested in contrast with animals that had not been vaccinated. Lorenz's investigation was commenced in April, 1902. The two cattle used by him are those numbered 30 and 48 in von Behring's report.†

Animal No. 30 was treated as follows:

- 1901, Nov. 28: 0.25 c.c. tuberculin subcutaneously.
Nov. 30: 0.012 gm. dried bovine tubercle bacilli intravenously.
1902, Jan. 8: 0.2 c.c. tuberculin subcutaneously.
Jan. 28: 0.2 c.c. tuberculin subcutaneously.
Feb. 4: 0.025 gm. dried dead tubercle bacilli from a rat intravenously.
Feb. 24: 0.05 gm. dried and ground tubercle bacilli intravenously.
Mar. 1: 0.2 c.c. tuberculin subcutaneously.
May 27: 0.5 c.c. tuberculin subcutaneously.
May 29: 0.02 gm. human tubercle bacilli intravenously.
June 6: 0.02 gm. attenuated tubercle bacilli (Arloing) intravenously.
June 12: 0.05 gm. attenuated tubercle bacilli (Arloing) intravenously.
1903, Feb. 26: 0.4 c.c. tuberculin subcutaneously.
Mar. 5: 0.01 gm. dried human tubercle bacilli intravenously.
Apr. 21: 0.1 gm. bovine tuberculous tissue subcutaneously.
May 4: 0.5 c.c. tuberculin subcutaneously.
July 5: 0.00375 gm. tubercle bacilli subcutaneously.
Aug. 6: 0.5 c.c. tuberculin subcutaneously.
Sept. 18: 0.001 gm. bovine tubercle bacilli subcutaneously.

The treatment of this animal that was given after March, 1903, occurred in Darmstadt, while the animal was under the care of Lorenz.

It will be seen that the animal was inoculated April 21st with 0.1 gm. tuberculous tissue from a cow. The inoculation was

*"Berliner thierärztliche Wochenschrift," No. 48, 1903.

†"Beiträge zur experimentellen Therapie," Heft 7, 1904.

made upon the left shoulder. A control animal (I) was inoculated similarly at the same time. Cow No. 30 did not react to this inoculation either generally or locally, while the control animal developed at the point of inoculation a considerable swelling. The control was killed June 17, 1903, and numerous tuberculous nodules were found in the vicinity of the seat of the subcutaneous inoculation. The left axillary lymphatic gland was also enlarged, and on section was found to contain caseous areas. The lymphatic glands of the left shoulder were in similar condition. There was also an infection of the bronchial and mediastinal lymphatic glands, and one tubercle was found in the right lung.

Cow No. 30 and a fresh control (II) that had not reacted to the tuberculin test were inoculated subcutaneously, July 5th, with 0.00375 gm. bovine tubercle bacilli. In cow No. 30 a swelling the size of a walnut occurred at the point of inoculation. This swelling gradually disappeared. In the control animal the swelling gradually became larger, and presently there was an enlargement of the lymphatic glands of the shoulder. This control (II) was killed August 29th. It was found that there was an infection at the seat of inoculation and also in the collateral lymphatic glands.

The other animal that was sent to Lorenz, No. 48, had had the following treatment:

- 1902, Feb. 21: 0.3 c.c. tuberculin subcutaneously.
- Feb. 24: 0.01 gm. attenuated tubercle bacilli (Arloing) subcutaneously.
- Mar. 11: 0.01 gm. human tubercle bacilli intravenously.
- May 27: 0.25 c.c. tuberculin subcutaneously.
- May 29: 0.02 gm. human tubercle bacilli intravenously.
- June 16: 0.04 gm. human tubercle bacilli intravenously.
- June 30: 0.06 gm. human tubercle bacilli intravenously.
- July 4: 0.15 gm. human tubercle bacilli intravenously.
- July 7: 0.2 gm. human tubercle bacilli intravenously.
- Aug. 25: 0.025 gm. bovine tubercle bacilli with 0.2 % iodin trichlorid intravenously.
- Sept. 25: 0.3 c.c. tuberculin subcutaneously.

- 1902, Oct. 11: 0.001 gm. dried avian tubercle bacilli intravenously.
Oct. 31: 0.002 gm. dried avian tubercle bacilli intravenously.
Dec. 22: 0.002 gm. avian tubercle bacilli intravenously.
Dec. 29: 0.004 gm. avian tubercle bacilli intravenously.
1903, Jan. 2: 0.008 gm. avian tubercle bacilli intravenously.
Feb. 26: 0.4 c.c. tuberculin subcutaneously.
Apr. 21: 0.1 gm. bovine tuberculous tissue subcutaneously.
May 14: 0.5 c.c. tuberculin subcutaneously.
July 5: 0.00375 gm. bovine tubercle bacilli subcutaneously.
Aug. 6: 0.5 c.c. tuberculin subcutaneously.
Aug. 31: 0.0025 gm. bovine tubercle bacilli subcutaneously.

It will be seen that this animal was treated by Lorenz after he received it in Darmstadt in April in precisely the same manner as was animal No. 30. The effect of the treatment was similar. There is no report to the effect that either of these animals was killed; both of them were returned to Marburg. From the fact that subcutaneous inoculations of these two vaccinated animals produced small temporary swellings, and that in the unvaccinated animals similar inoculations caused infection, Lorenz draws most far-reaching conclusions. What Lorenz's experiments prove is, that the inoculation of an unvaccinated animal with fresh tuberculous material from a cow will produce a gradually progressive infection, and that a similar subcutaneous inoculation of an untreated or unvaccinated animal with a small quantity of pure culture of bovine tubercle bacilli will produce infection at the point of inoculation. In this case the infection did not extend to other parts of the body, probably because sufficient time was not allowed, since the animal was killed three weeks after the inoculation. The experiments also show that cattle which have been treated as von Behring's cattle Nos. 35 and 48 were treated, with numerous injections of tubercle bacilli of human, bovine, and avian type, appear to be able to resist subcutaneous inoculations better than such inoculations are resisted by unvaccinated animals.

As the treated animals are not killed, it is premature and un-

safe to conclude that they were not infected by the inoculation they received while under Lorenz's charge. Even if they were not infected by these inoculations, it is most illogical and is impossible, as a result of these experiments, to conclude that the von Behring system of vaccinating cattle is effective, for the reason that the cattle in question were not vaccinated according to the system which is recommended by von Behring. Both of these cattle received prolonged preliminary treatment and a large number of injections of various kinds of tubercle bacilli in varying quantities and at irregular times.

The work and report of Lorenz throw little light on the question of the immunization of cattle against tuberculosis, and are absolutely of no value as a contribution to knowledge of von Behring's present system for vaccinating cattle practically upon farms. However, Lorenz did not hesitate to conclude that—"After all that I have seen up to this time, I have become convinced that we have here to do with a procedure that will succeed, and that in the repression of tuberculosis of cattle it will be of immense value, and through its low cost and ease of application, it surpasses and it makes superfluous all methods for the suppression of this disease that have heretofore been proposed."* But he more cautiously adds, at the close of his lecture, the statement: "Now we shall joyfully take the next step and test von Behring's method in practice."

Hutyra,† director of the Institute for the Study of Infectious Diseases of Animals of the Royal Veterinary High School in Budapest, and for the Hungarian Government, made a number of experiments on the immunization of cattle by the method of von Behring and other similar methods. Hutyra divides his experiment into three groups or series:

The first series includes animals that were vaccinated by the

* "Berliner thierärztliche Wochenschrift," No. 48, p. 137, 1903.

† "Beiträge zur experimentellen Therapie," Heft 9.

method of von Behring and whose immunity was tested by intravenous and subcutaneous inoculations with bovine tubercle bacilli and compared with controls similarly inoculated, but not previously vaccinated. The first four animals (two vaccinated and two controls) were infected by intravenous inoculation, the fifth and sixth animals (one vaccinated and one control) were infected by subcutaneous inoculation.

Three animals of the first series were inoculated intravenously with 0.004 gm. human tubercle bacilli. Forty days later they were again inoculated with two and one-half times the original dose. Two months later they were inoculated with virulent bovine culture. These cattle are designated as Nos. 2, 8, 6; the detail reports on them are as follows:

No. 2.

Heifer, nine months old, weight, one hundred and fifteen kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 2: 0.01 gm. human tubercle bacilli intravenously.

Sept. 2: 0.02 gm. bovine tubercle bacilli intravenously.

Nov. 25: Killed.

Necropsy.—Mediastinal lymphatic glands are enlarged and contain yellow tubercles. In the lungs there are some catarrhal pneumonic areas containing gray tubercles in which tubercle bacilli are found.

No. 8.

Male calf, nine months old; weight, one hundred and thirty-two kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 2: 0.01 gm. human tubercle bacilli intravenously.

Sept. 2: 0.02 gm. bovine tubercle bacilli intravenously.

Nov. 25: Killed.

Necropsy.—Peribronchial and mediastinal lymphatic glands somewhat swollen and contain a few yellow tubercles. In the lungs there are numerous miliary tubercles containing tubercle bacilli.

No. 12.

Male calf, one year old; weight, one hundred and fifty-eight kilos. Control, not vaccinated.

1903, Sept. 2: 0.02 gm. bovine tubercle bacilli intravenously.

Oct. 4: Killed.

Necropsy.—Numerous areas of catarrhal pneumonia, especially in the anterior lobes, with miliary tubercles and lentil-sized caseous lesions. Mediastinal lymphatic glands the size of a child's fist and contain numerous yellow tubercles.

No. 16.

Male calf, one year old; weight, one hundred and fifty kilos. Control, not vaccinated.

1903, Sept. 2: 0.02 gm. bovine tubercle bacilli intravenously.

Oct. 20: Killed.

Necropsy.—Anterior third of the lungs hepatized, contains many caseous areas. In other portions of the lungs there are countless miliary tubercles. Peribronchial and mediastinal lymphatic glands tuberculous.

No. 6.

Heifer calf, nine months old; weight, one hundred and five kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 3: 0.01 gm. dried human tubercle bacilli intravenously.

Sept. 2: 0.02 bovine tubercle bacilli subcutaneously.

Nov. 25: Killed.

Necropsy.—At the point of inoculation there is a 'cheesy area the size of a large bean, which contains tubercle bacilli. The left prescapular lymphatic glands are tuberculous.

No. 4.

Heifer calf, one year old; weight, one hundred and thirty-five kilos. Control, not vaccinated.

1903, Sept. 2: 0.02 gm. bovine tubercle bacilli subcutaneously.

Nov. 25: Killed.

Necropsy.—There is considerable caseation at point of inoculation and the collateral lymphatic glands are tuberculous. Lesions of tuberculosis are also found in the lungs, in the liver, in the kidneys, and on the pulmonary pleura.

In the second series of experiments vaccinations were made with von Behring's vaccine, the first dose being one "immunizing unit" and the second two and one-half or ten times as great. Test infections were made by feeding cultures of bovine tubercle bacilli and later by intravenous inoculation with bovine tubercle bacilli. The vaccinated animals were known as Nos. 1, 3, 5, and 7. The details of these experiments are as follows:

No. 1.

Heifer calf, nine months old; weight, eighty-nine kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 3: 0.04 gm. dried human tubercle bacilli intravenously.

Sept. 2-16: 0.3 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

1904, Mar. 3: Killed.

Necropsy.—Most of the lymphatic glands are swollen. The peribronchial and mediastinal glands contain caseous areas. The prescapular glands are considerably enlarged. In the liver there are a few lentil-sized, grayish-yellow, caseous areas containing tubercle bacilli.

No. 3.

Heifer calf, nine months old; weight, ninety-five kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 3: 0.04 gm. dried human tubercle bacilli intravenously.

Sept. 2-16: 0.3 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

1904, Jan. 11: Killed; in the last stage of tuberculosis.

Necropsy.—Disseminated miliary tuberculosis of both lungs; peribronchial lymphatic glands are enlarged and tuberculous. The other lymphatic glands are somewhat swollen.

No. 5.

Heifer calf, one year old; weight, one hundred and fourteen kilos.

1903, May 3: 0.004 gm. dried human tubercle bacilli intravenously.

July 3: 0.01 gm. dried human tubercle bacilli intravenously.

Sept. 2-16: 0.03 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

1904, Mar. 3: Killed.

Necropsy.—The tonsils, the postpharyngeal lymphatic glands, the peribronchial and mediastinal glands are somewhat swollen and contain yellow tubercles. Some acute swelling of the prescapular and popliteal lymphatic glands. A few small tuberculous lesions in the spleen and in the right kidney.

No. 7.

Heifer, one year old; weight, one hundred and twenty-eight kilos.

1903, May 23: 0.004 gm. dried human tubercle bacilli intravenously.

July 23: 0.04 gm. dried human tubercle bacilli intravenously.

Sept. 2-16: 0.3 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

1904, Mar. 3: Killed.

Necropsy.—There was a moderate amount of swelling of the prescapular, peribronchial, mediastinal, mesenteric, and supramammary lymphatic glands. In one of the peribronchial glands there were two caseous tubercles. Upon the costal pleura and upon the peritoneum covering the diaphragm there were a few red, soft flakes. Tubercle bacilli were not found.

No. 13.

Heifer, one year old; weight, one hundred and twenty-five kilos. Control, not vaccinated.

1903, Sept. 2-16: 0.3 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

1904, Feb. 2: Dead.

Necropsy.—Miliary tuberculosis of both lungs. Lesions of tuberculosis were also found in the mucous membrane of the ileum, where there were a number of tuberculous ulcers. Tubercles were present in the peribronchial and mediastinal glands, also in the kidneys.

No. 14.

Male calf, nine months old; weight, ninety-six kilos. Control, not vaccinated.

1903, Sept. 2-16: 0.03 gm. bovine tubercle bacilli with the food every second day.

Dec. 2: 0.025 gm. bovine tubercle bacilli intravenously.

Jan. 11: Killed, in the last stage of disease.

Necropsy.—Anterior thirds of both lungs are involved in catarrhal pneumonia, contain lentil-sized caseous areas. Elsewhere in the lungs there are numerous miliary tubercles. Peribronchial lymphatic glands are tuberculous.

In this second series of experiments it was intended to test the resistance of vaccinated animals against controls when exposed to infection by feeding. The plan of the experiment was changed

when it was found, upon testing the cattle with tuberculin two months after feeding them tubercle bacilli, that neither of the controls reacted strongly to the test, although both showed some rise of temperature—one to 39.9° and the other to 40.1° C. Of the vaccinated animals, No. 1 reacted, but there appears to be no doubt, as a result of the post-mortem examinations, that animal No. 5 was also infected during the period of feeding. One of the controls, No. 13, showed distinct evidence of food-infection.

The result of the use of tuberculin in these cases is interesting because it seems to signify that even though an animal becomes infected with tuberculosis after it is vaccinated, it may not respond to the tuberculin test. In consequence of the unexpected result of the tuberculin test, all these animals were inoculated intravenously, December second, with what must be looked upon as a very large dose of virulent bovine tubercle bacilli. Following this inoculation all the animals became tuberculous, but it is clear that the infection was much more severe in two of the controls, and in one of the vaccinated animals (No. 3), than it was in the other three vaccinated cattle. Notwithstanding the heavy inoculation to which these animals (Nos. 1, 5, and 7) were subjected, it appears that tubercles had not developed in the lungs. The lesions that were found were in the lymphatic glands, liver, spleen, and kidneys.

As perhaps the most important feature of this experiment it should be observed that vaccination by von Behring's method did not protect calf No. 5 from infection by feeding.

Animal No. 7 almost wholly escaped infection, showing that it had a very high degree of resistance. Both animals Nos. 3 and 7 received identically the same preliminary treatment and inoculations. One of them became very extensively infected, from which it would have died, while the other was very slightly disturbed. It is clear that cattle differ greatly in their predisposition to tuberculosis, and in their resistance to it both under natural conditions of exposure and artificial inoculation.

In the third series of experiments different races of tubercle bacilli were used for the purpose of immunization. Control inoculations were made intravenously with virulent bovine tubercle bacilli. One of the cultures (I) used for immunization was from a tuberculous monkey. This culture was found to be highly virulent for guinea-pigs and for horses—for the latter when administered intravenously. One of the cultures of human tubercle bacilli (II) was from the extirpated cervical glands of a girl; the other human culture (III) was from the pleuritic exudate of a consumptive. The culture that was used for making the test inoculation upon the vaccinated cattle was of von Behring's bovine tubercle bacillus No. 18. Of the four controls that were inoculated for the purpose of comparison with the vaccinated animals, one was inoculated with von Behring's culture No. 18 and the other three with three different cultures of bovine tubercle bacilli that were isolated from different tuberculous cattle—the first from a liver of a cow, the second from the udder of a cow, and the third from the lung of a cow.

No. 15.

Heifer, nine months old; weight, one hundred and sixty-three kilos.

1903, Oct. 31: 0.005 gm. tubercle bacilli from a monkey intravenously.

Dec. 9: 0.025 gm. tubercle bacilli from a monkey intravenously.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Apr. 30: Killed.

Necropsy.—Peribronchial and mediastinal lymphatic glands enlarged and tuberculous, but not extensively so. In the lungs there are a few caseous nodules the size of a hemp-seed.

No. 18.

Heifer calf, five months old; weight, eighty-two kilos.

1903, Oct. 31: 0.005 gm. human tubercle bacilli intravenously.

Dec. 9: 0.025 gm. human tubercle bacilli intravenously.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Apr. 30: Killed.

Necropsy.—Lungs entirely normal. Some of the lymphatic glands were swollen, but none of them contained tubercles. Upon the costal pleura there

were a few reddish-gray, soft tufts. No tubercle bacilli were found excepting by the inoculation of guinea-pigs with these tufts.

No. 19.

Heifer calf, six months old; weight, one hundred and two kilos.

1903, Oct. 31: 0.005 gm. human tubercle bacilli intravenously.

Dec. 9: 0.025 gm. human tubercle bacilli intravenously.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Apr. 30: Killed.

Necropsy.—In the lungs four yellowish-gray, encapsulated nodules were found. One of these was as large as a hemp-seed and the other three the size of millet-seeds. The peribronchial and mediastinal glands contained numerous calcified nodules, but the glands themselves were not materially enlarged.

No. 20.

Heifer calf, three and one-half months old; weight, seventy kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 24: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs. Peribronchial and mediastinal lymphatic glands are enlarged and tuberculous.

No. 21.

Heifer calf, three and one-half months old; weight, seventy-two kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 28: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs and of the liver, kidneys, and pectoral lymphatic glands.

No. 22.

Heifer calf, four months old; weight, eighty kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 25: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs, of the liver, kidneys, and pectoral lymphatic glands.

No. 23.

Heifer calf, four months old; weight, eighty kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 14: Dead.

Necropsy.—Acute miliary tuberculosis of the lungs and of the pectoral lymphatic glands.

Apparently the culture of tubercle bacilli from a monkey and the two cultures of human tubercle bacilli used by Hutyra were as valuable, or more valuable, for the protection of cattle against inoculation with bovine tubercle bacilli than was the vaccine prepared by von Behring. Notwithstanding the fact that the quantity of bovine culture that was used was large and was sufficient to cause death in unvaccinated animals in less than three weeks, the vaccinated animals were protected to such an extent that they were infected only in a few lymphatic glands: in one instance, upon the costal pleura, and in another in a few small points in the lungs. It is reported that the pulmonary lesions that were found in animal No. 19 were encapsulated, and that other lesions found in the same animal—those of the peribronchial lymphatic glands—had undergone calcification. While the vaccination that was given in these cases did not wholly protect the experimental animals, it did unquestionably increase their resistance to a large extent.

The experiments of Hutyra are especially interesting because they are almost the only experiments that have been made in Europe and reported upon, wherein animals vaccinated but twice, after the method now recommended by von Behring, have, together with controls, been tested as to their immunity by inoculation with virulent bovine culture, and wherein post-mortem examinations were afterward made and published.

Since all the animals vaccinated with von Behring's vaccine became infected with tuberculosis in some degree, and since one of them (No. 3) appeared to have received no immunity whatever, it cannot be said that the claims of von Behring are proved by the results of this experiment. It must, however, be borne in mind that the quantity of infectious material that was used

were a few reddish-gray, soft tufts. No tubercle bacilli were found excepting by the inoculation of guinea-pigs with these tufts.

No. 19.

Heifer calf, six months old; weight, one hundred and two kilos.

1903, Oct. 31: 0.005 gm. human tubercle bacilli intravenously.

Dec. 9: 0.025 gm. human tubercle bacilli intravenously.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Apr. 30: Killed.

Necropsy.—In the lungs four yellowish-gray, encapsulated nodules were found. One of these was as large as a hemp-seed and the other three the size of millet-seeds. The peribronchial and mediastinal glands contained numerous calcified nodules, but the glands themselves were not materially enlarged.

No. 20.

Heifer calf, three and one-half months old; weight, seventy kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 24: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs. Peribronchial and mediastinal lymphatic glands are enlarged and tuberculous.

No. 21.

Heifer calf, three and one-half months old; weight, seventy-two kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 28: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs and of the liver, kidneys, and pectoral lymphatic glands.

No. 22.

Heifer calf, four months old; weight, eighty kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 25: Dead.

Necropsy.—Acute miliary tuberculosis of both lungs, of the liver, kidneys, and pectoral lymphatic glands.

No. 23.

Heifer calf, four months old; weight, eighty kilos. Control, not vaccinated.

1904, Jan. 28: 0.02 gm. bovine tubercle bacilli intravenously.

Feb. 14: Dead.

Necropsy.—Acute miliary tuberculosis of the lungs and of the pectoral lymphatic glands.

Apparently the culture of tubercle bacilli from a monkey and the two cultures of human tubercle bacilli used by Hutyra were as valuable, or more valuable, for the protection of cattle against inoculation with bovine tubercle bacilli than was the vaccine prepared by von Behring. Notwithstanding the fact that the quantity of bovine culture that was used was large and was sufficient to cause death in unvaccinated animals in less than three weeks, the vaccinated animals were protected to such an extent that they were infected only in a few lymphatic glands: in one instance, upon the costal pleura, and in another in a few small points in the lungs. It is reported that the pulmonary lesions that were found in animal No. 19 were encapsulated, and that other lesions found in the same animal—those of the peribronchial lymphatic glands—had undergone calcification. While the vaccination that was given in these cases did not wholly protect the experimental animals, it did unquestionably increase their resistance to a large extent.

The experiments of Hutyra are especially interesting because they are almost the only experiments that have been made in Europe and reported upon, wherein animals vaccinated but twice, after the method now recommended by von Behring, have, together with controls, been tested as to their immunity by inoculation with virulent bovine culture, and wherein post-mortem examinations were afterward made and published.

Since all the animals vaccinated with von Behring's vaccine became infected with tuberculosis in some degree, and since one of them (No. 3) appeared to have received no immunity whatever, it cannot be said that the claims of von Behring are proved by the results of this experiment. It must, however, be borne in mind that the quantity of infectious material that was used

for testing these animals was very great, and the resistance that was shown by some of them after this ordinarily overwhelming inoculation is noteworthy and instructive. The higher average immunity shown by the animals vaccinated with Hutyra's own cultures may have been due to the fact that he used fresh, living, active bacilli, in contradistinction to the dry and more or less attenuated organisms in von Behring's vaccine.

Both Hutyra and his distinguished colleague, Preisz, are now conducting in Budapest additional investigations upon preventive vaccination, the latter with his own cultures and vaccine material. Some of Hutyra's experiments are being made on farms where a part of the young cattle are vaccinated and some are unvaccinated, and all are exposed to contact with tuberculous cattle. As yet, there is no report on these experiments.

Albrecht* has experimented with von Behring's tuberculosis vaccine upon goats, cats, and dogs of different races. He has graduated his dose according to the weight of the animal. None of the animals appear to have been disturbed by the vaccination. Whether they are by this means protected against tuberculosis remains to be shown.

Casper† has made a large number of vaccinations with von Behring's tuberculosis vaccine. He has found that, as the vaccine is sent out, there is considerable difficulty in emulsifying it in such a way as to render possible accurate dosage. He has also found that the vaccination is not always without danger even for healthy animals. Casper does not report any efforts to test the immunity of animals that have been vaccinated, and he remarks that the method is still so new that it is impossible to estimate its real value.

Marks‡ has also found that there is great difficulty in emulsifying the von Behring vaccine in such a way as to make pos-

* "Wochenschrift für Thierheilkunde und Viehzucht," vol. 8, No. 48.

† No. 76, "Versam. deutsche Naturforscher und Aerzte," September, 1904.

‡ "Berliner thierärztliche Wochenschrift," No. 24, 1904.

sible accurate dosage, and that the vaccination of calves is not always unattended by danger. He found that in a number of herds, after the first vaccination, from one-fourth to one-third of the calves showed dyspnea and a cough immediately after the injections. In some instances where calves were suffering with infectious pneumonia in the latent form the vaccinations appeared to excite the disease. In one case calves were so badly affected by the vaccination that it was necessary to kill five out of twenty-six, and in another case three out of twelve. Marks reports:

"A well-marked inoculation tuberculosis occurred in four calves of a lot of seventeen. All of the seventeen animals refused their food for a few days, and four continued to show a poor appetite and become thin. In about three weeks it was necessary to kill three of the calves and they showed extensive tuberculous lesions of the lungs, while the fourth animal died five weeks after inoculation of a well-marked embolic tuberculosis of the lungs. The microscopic examination showed tubercle bacilli, and the lesions were those of a tuberculosis of about five weeks' duration: small and large, wholly caseous or partly calcareous nodules in the lungs, the bronchial and mediastinal lymphatic glands very much enlarged, caseous, and partly calcareous. In this lot of seventeen head, six in all showed the usual respiratory symptoms. Of these, four were lost and the other two continued to cough, and in June it will be decided whether they shall be inoculated a second time or killed. It is to be noted that another lot of seventeen calves vaccinated in another place on the same day with the same vaccine did not show bad results.

"That the vaccinated calves should refuse their food for a few days after the first, and especially after the second, vaccination is regarded by the farmers as but natural. Even the severe dyspnea accompanied by coughing that occurs so often is not regarded seriously by the owners. Occasionally it is necessary to kill an animal with severe dyspnea one or two days after the first vacci-

nation. In this case the question arises as to whether the meat of such an animal can be used without restriction, and, if so, when. One animal which appeared to be quite well forty-eight hours after vaccination, and then suddenly developed convulsions and was found to have a tuberculous meningitis, should surely be condemned; also an animal which developed a beautiful embolic pneumonia forty-eight hours after the inoculation. The time when the tubercle bacilli leave the circulation or lose their virulence should be established accurately for the benefit of meat inspection.

"Farmers would be glad to part with some calves that it might be necessary to kill if they could be disposed of as meat of inferior grade, if there were a guarantee that the other vaccinated calves would remain well and be immune to tubercle bacilli.

"The nature of the subject is such that the question as to whether the inoculated calves become immune for a long time cannot be measured for years.

"My experiences with inoculation, which will not deter me from making other inoculations, have shown:

"1. The inoculation of apparently healthy calves is not always free from danger. 2. The tubercle bacilli (vaccine) cannot be perfectly emulsified. 3. The doses are variable both from the above cause and because the vaccine loses virulence.

"In conclusion, one must only inoculate healthy calves, and it is important to determine just when the flesh ceases to be unwholesome."

Von Behring in his later reports* has recommended a system for vaccinating cattle which varies a little from that first advised, and consists of making an intravenous injection of 0.004 gm. dried human tubercle bacilli or one "immunizing unit," to be followed in not less than twelve weeks by a similar injection of five times the original quantity, or 0.02 gm.

* "Beiträge zur experimentellen Therapie," Heft 7, 1904.

He now recommends vaccination especially for calves from three weeks to four months old at the time of the first vaccination. However, older cattle can be vaccinated,—cattle from four months to two years of age,—but only when the animals are free from all evidence of tuberculosis, and when they have failed to respond to the tuberculin test. In this manner a large number of young cattle have been vaccinated in various parts of Germany, Austria, and Hungary.

Vaccinations have been carried out on a large scale on the Sárvár and Ujmajor estates in Hungary. The work there has been under the direction of Dr. Strelinger,* who has under observation about six hundred vaccinated cattle, some of which have been vaccinated as much as eighteen months, and he is satisfied that the cattle have not been injured by vaccination; their thrift and growth are not unfavorably influenced.

Strelinger carried out an experiment for the purpose of testing the resistance of vaccinated animals as follows: Four calves that appeared to be in good health and that did not respond to the tuberculin test were vaccinated systematically and repeatedly with increasing doses so that they might be highly immunized. Two animals about four months old were vaccinated twice in the usual way. One animal about four months old was vaccinated once, and with these was placed a control animal that was proved by the tuberculin test to be healthy. Six of these animals—that is, all but two of those that were most highly immunized—were inoculated intravenously with a small dose† (0.0005 gm.) of bovine tubercle bacilli. Two months later all these animals were tested with tuberculin. It was found that of the two animals that had been vaccinated repeatedly, one did not respond to the tuberculin test, while the other responded in quite a typical manner, the temperature remaining high for four

* "Beiträge zur experimentellen Therapie," Heft 8, Anlage A.

† The quantity of the same strain of bacteria (von Behring's No. 18) used by Hutyrá for testing the immunity of his vaccinated cattle was fifty times as great.

hours; the two cattle that were vaccinated twice reacted to the test, the temperature remaining high for twelve hours; the animal that was vaccinated once reacted to tuberculin, the temperature remaining high for sixteen hours. The control animal that was not vaccinated, but which, nevertheless, was inoculated intravenously with bovine tubercle bacilli, as the others were, reacted strongly to the tuberculin test. As all these animals were still living at the time of the report, it is quite impossible to draw final conclusions from the experiment.

The same writer has furnished some interesting facts upon the effect of tuberculin on cattle that have been vaccinated. Forty-five cattle that had been vaccinated for twelve to sixteen months were tested with tuberculin. Of these, thirty-six did not react, eight gave a febrile reaction that lasted but a short time, and one gave a reaction lasting several days. Twenty-three cattle were tested that had been vaccinated for from six to eight months. Of these, twelve did not react; ten gave a febrile reaction lasting a short time, and one gave a reaction lasting several days. It appears, therefore, that of the sixty-eight vaccinated cattle that were tested with tuberculin twenty, or almost 30 %, responded to the tuberculin test in a way that is in the practical testing of herds regarded as denoting the presence of tuberculosis. This is a matter of much practical importance because it shows that after an animal is vaccinated with von Behring's vaccine the diagnostic value of the tuberculin test as applied to that animal is greatly diminished. It should be stated that few of the above animals reacted again when tested some months later, although some reacted several times.

In a lot of thirty-nine cattle reported by Rösler to von Behring* seventeen, after receiving an injection of tuberculin, showed a distinct febrile reaction of short duration. All these calves were

* "Beiträge zur experimentellen Therapie," Heft 10.

from a healthy herd, so the hypersensitiveness to tuberculin shown by reaction must have been due to the vaccination.

Saas found in a number of animals that he vaccinated with von Behring's vaccine that there followed diarrhea, loss of appetite, and sometimes fever and coughing lasting for several days. This occurred in some animals that had been previously tested with tuberculin and had not reacted. It was necessary, in some of Saas' cases, to kill animals after vaccination on account of severe illness resulting therefrom.

It is estimated by von Behring* that in the latter part of the summer of 1904 as many as 10,000 animals had been vaccinated with his vaccine. Most of these animals are in Hungary, Austria, Bohemia, and in Mecklenburg and Hessen. A number of animals have also been vaccinated in eastern Prussia. Von Behring says: "When I say that approximately 10,000 calves have been vaccinated with good results, I mean that the method of vaccination is not injurious when it is intelligently carried out according to my directions, and that the vaccinated animals during the time that they have been under observation are in better condition in respect to such symptoms as are associated with progressing tuberculous disease than animals of the same sort not vaccinated and kept under the same conditions."

As yet there is little evidence obtained from post-mortem examinations on animals vaccinated by von Behring's method and afterward exposed to infection. At least, this evidence is not a matter of record. It is claimed that the mortality from tuberculosis among vaccinated calves in infected herds is now less than before vaccination was practised. However, the mortality from tuberculosis among calves under any conditions is so low that this difference cannot be regarded as especially significant. Moreover, present conditions, compared with conditions existing

* "Beiträge zur experimentellen Therapie," Heft 10.

at previous times, may be different as a result of the operation of more than one variation.

On this point Klimmer,* writing upon von Behring's work, says: "Of the vaccinated animals, only a small number have yet been slaughtered. In many cases the animals have not been examined scientifically, but only in the routine of practical meat inspection, and usually reported to be free from tuberculosis. The cattle that showed lesions of tuberculosis have been said to have been tuberculous, or probably so, before they were vaccinated."

More definite trials are now being made under von Behring's personal supervision. He has now thirty-six heifers obtained from a herd of fifty. These animals have been vaccinated in accordance with a variation of von Behring's present method. They are now kept in an old stable on his own farm at Marburg. This is a stable that in the past has been occupied by many tuberculous cattle. It is stated that all unvaccinated cattle have now been removed from this stable, and it is at present occupied by the thirty-six cattle referred to. These animals are now about two years old and are expected to calve during the winter of 1904-'05. "If it shall be proved in the course of the years that these vaccinated animals do not develop hypersensitiveness to tuberculin,† even after they are used for intensive milk production and after breeding, that the milk production is no less than that of healthy unvaccinated animals of the same breed, and that when they are killed no lesions of tuberculosis are found and that the yield of meat is good, then I shall consider that the question of a practically useful system for controlling tuberculosis of cattle is solved." Surely the problem cannot be looked upon as being solved before evidence of this sort is in hand, but if it is definitely to be shown that vaccination is wholly successful in relation to the

* "Berliner thierärztliche Wochenschrift," No. 30, 1904.

† This does not mean that they may not react to the tuberculin test as it is generally used by veterinarians for diagnostic purposes.

thirty-six young animals referred to, it will be necessary not only to keep them in a common stable, such as they now occupy, from which tuberculous cattle have been removed, but it will also be necessary to place in this stable a considerable number of cattle afflicted with tuberculosis, so that the vaccinated cattle will be in constant daily contact with tuberculous animals and continually exposed to infection.

That von Behring recognizes the significance of this phase of the subject is shown by the quotation that follows: * "Until the final settlement of the question as to whether my system for protecting cattle against tuberculosis will also prove to be effective for such cattle in highly infected herds and stables as are known to be especially exposed, attention should be paid, as far as possible, to lessening the danger of infection by the use of the measures recommended by Ostertag, whereunder all cattle with open tuberculosis are excluded from the stable. . . . Where the conditions are such as to make it possible, the vaccinated cattle should be kept together in a stable free from tuberculosis infection."

There is in von Behring's reports a remarkable lack of direct experimental evidence as to the value of the two-treatment method of vaccination he is now recommending. With the exception of Hutyra's report, there is practically nothing on record to show that definite comparative trials have been instituted to show to what extent vaccinated animals are more resistant to infection than unvaccinated animals. In place of definite comparisons of parallel series of vaccinated and unvaccinated animals under the same conditions there are numerous observations, such as the following: † . . . "I don't know whether it is only in my eyes, but I am inclined to say that last year's calves here and in Schlepko, all of which were inoculated, look better than those

* "Beiträge zur experimentellen Therapie," Heft 8.

† "Beiträge zur experimentellen Therapie," Heft 8, 1904.

in Hornshagen, where I did not have inoculations made last year. The animals on the first two farms look smoother and more thrifty than on the other farms, although the manager at Hornhausen is very careful with the cattle. Neither here nor in Schlep-kow have I heard an animal cough during the whole year. I should say that this is a sign that none of the inoculated animals are tuberculous or show any disposition to become so" (!).

. . . . "Last week an immunized calf, six months old, broke its leg and was killed. The very careful macroscopic and microscopic examination of the dissected animal failed to reveal lesions of tuberculosis or tubercle bacilli, notwithstanding the fact that the animal was in an extensively infected herd.

. . . . "If, in cold weather, one suddenly opens the stable door and allows the cold air to pass over the animals, . . . one can see that uninoculated animals that may be with those inoculated at once begin to cough, while our inoculated animals are not affected." None of which can be regarded as scientific evidence.

At Koepenick, near Berlin, an interesting and valuable experiment is being carried out in the large herd of Mr. Bolle. A portion of the calves are being vaccinated and others are left without vaccination; it is proposed to grow these calves to maturity, put them into dairy herds or fatten them for beef, and in this way throughout the entire lives of the animals and after they are killed study and make comparisons between the vaccinated and unvaccinated animals.

Kossel* has reported to the Committee on Tuberculosis of the Imperial Health Office that he had been able to show that cattle after receiving an intravenous injection of 0.05 gm. of human tubercle bacilli, not virulent for them, are then resistant to subcutaneous and intravenous inoculations with doses of bovine tubercle bacilli that are fatal to control animals. He had tested

* "Aufzeichnungen über die Sitzung des Unterausschusses für Tuberkulose," June 25, 1904.

the immunity of vaccinated animals only by artificial inoculation, and considered that, in the interest of agriculture, other experiments should be made to further test the possibility of immunizing cattle against natural infection, by inhalation and feeding.

E. Levy* has immunized guinea-pigs against tuberculosis by treating them with several injections of tubercle bacilli weakened by glycerin. He found that when tubercle bacilli were placed in 80 % glycerin for forty-eight hours they became incapable of causing disease. If exposed in glycerin but twenty-four hours, they were still capable of causing thickening and an abscess at the seat of inoculation, from which the animal recovered.

Levy administered subcutaneously to guinea-pigs 0.25 to 0.5 c.c. of emulsions of tubercle bacilli that had been exposed to glycerin six, five, four, three, and two days, respectively. The intervals between vaccinations varied in length; they were always long enough to permit the animal to recover fully from the effects of the previous injection. When two guinea-pigs treated in this way were, together with two controls, inoculated with virulent culture, the vaccinated guinea-pigs developed abscesses at the seat of inoculation and were fully restored to health in four weeks, while one of the controls died in thirteen weeks of generalized tuberculosis and the other, when killed, was extensively infected. The vaccinated guinea-pigs were also killed and no lesions of tuberculosis were found.

The need for further definite trials and comparisons is recognized in France so clearly that, in December, 1904, Professor Vallée, of the National Veterinary School at Alfort, commended an experiment under the general control of a committee of the Société Médecin Vétérinaire Pratique with twenty vaccinated and twenty control animals for the purpose of testing the value of tuberculosis vaccination. These experiments are planned in such a way as to make it possible that they may furnish important in-

* "Centralbl. f. Bakt.," 1903, p. 701.

formation as to the efficiency of vaccination under the conditions governing the animals in this trial.

From the facts that have been presented in this paper it will be seen that the vaccination of cattle against tuberculosis is a gradual and natural outcome of immunization experiments that have been made upon animals with extracts from tubercle bacilli, with ground tubercle bacilli, with dead tubercle bacilli, and with living tubercle bacilli non-virulent for the animals vaccinated.

There has been some discussion, part of it (in Germany) rather acrimonious, as to whom credit should be given for the discovery of antituberculosis vaccination as applied to cattle. It is claimed by Neufeldt* that the credit should be given to Koch for his work reported to the London Tuberculosis Congress in 1902. He says: "The foundation for the success of tuberculosis immunization was laid by the investigations of Koch upon the relations between human and bovine tuberculosis. The proof that is furnished by him as to the non-identity of these two diseases furnished us with the key to immunization against tuberculosis; with one stroke it was made possible to immunize animals of a species that is susceptible only to one form of the virus by treating them with the other form of virus." If it is true that the discovery of the non-identity of human and bovine tubercle bacilli and the collateral fact that cattle are not infected by tubercle bacilli of what is now commonly known as the human type, then the credit for the discovery that has made immunization possible belongs not to Koch but to Theobald Smith.

It is well known in this country, and the fact cannot be expressed too clearly, that the first definite and unimpeachable evidence of the existence of two types of mammalian tubercle bacilli was that furnished by Theobald Smith in 1896.† His ex-

* "Deutsche med. Wochenschrift," September 10, 1903.

† "Transactions Assoc. Amer. Physicians," 1896.

haustive paper upon this subject was published in 1898.* The evidence furnished in this classical paper by Smith as to the existence of two types of tubercle bacilli is even more complete than that furnished by Koch in his paper read in London three years later.

At the London Tuberculosis Congress a paper was presented by Ravenel† based upon the work of himself and his colleagues in the laboratory of the Pennsylvania State Live-stock Sanitary Board, which furnished evidence to the effect that there are two types of mammalian tubercle bacilli differing in respect to virulence and also that some of the conclusions drawn by Koch from his investigations and observations were untenable. The position taken by Ravenel at that time has since been strongly confirmed by a very large number of investigators.

If credit for the discovery of vaccination against tuberculosis should go to the men who first successfully employed that principle of vaccination against tuberculosis which governs the vaccination of cattle as now practised, then the work of Dixon, Trudeau, and de Schweinitz must not be overlooked. Dixon discovered in 1889 that a rather high degree of immunity to tuberculosis could be produced artificially in experimental animals by preliminary inoculations with attenuated tubercle bacilli.

Trudeau‡ reported in May, 1893, that by preventive inoculations of living bird tubercle bacilli in rabbits he got undoubted evidence of a marked degree of artificial immunity. He was able then to demonstrate by means of living animals that in the rabbits having previously received the preventive injections of living bird bacilli the tubercle inoculations at first gave rise to a violent reaction of the tissues which ended generally in recovery, while the tuberculous process similarly induced in the controls

* "The Journal of Experimental Medicine," vol. iii, Nos. 4, 5, 1898.

† "The Lancet," vol. ii, Nos. 6, 7, 1901; "Univ. of Pennsylvania Med. Bulletin," September, 1901.

‡ "Transactions Assoc. Amer. Physicians," 1893.

was steadily progressive. Trudeau discovered that toxic immunity and bacterial immunity in tuberculosis did not go hand in hand, and that while he could accustom animals by gradually increased doses at intervals to bear with impunity amounts of tuberculin and other toxic products of the bacillus which at first would have proved fatal, this toxic immunity did not protect the animal against the infection of its tissue by living virulent bacilli that were subsequently inoculated. "It was only when I began to make use of living cultures as a protective inoculation that I met any encouraging results, and my experience would indicate that the living germ is essential to what success has been attained in the production of artificial immunity against tuberculosis."*

De Schweinitz† reported in 1894 experiments wherein guinea-pigs that were treated with attenuated human tubercle bacilli were afterward inoculated with tuberculous material from a cow. This experiment has already been referred to in this paper. It will be recalled that guinea-pigs that had received preliminary inoculations with attenuated tubercle bacilli resisted infection and remained free from tuberculosis, while control animals inoculated with the same material from a cow, died of tuberculosis within seven weeks.

If credit for this discovery should be given to the investigator who first succeeded in increasing to a very high degree the resistance of cattle against inoculation with virulent bovine material, and in producing considerable, but not complete, immunity, then it is McFadyean who should receive the honor. McFadyean's publications in June, 1901, and in March, 1902, are the first publications in any literature upon experiments regarding the immunization of cattle against tuberculosis. Unfortunately, the work of McFadyean was not continued; but his few observations, as they stand, are very important, and unquestionably mark the begin-

* Address before the Henry Phipps Institute, "Medical News," October 24, 1903.

† "Medical News," December 8, 1894.

ning of work in a new field. They are quite as convincing as von Behring's experiments as published in 1902 in part 5 of his "Beiträge."

If credit for this discovery should be given to those who made the first experiments in which it was proved by post-mortem examinations that cattle were definitely and highly immunized against virulent bovine tubercle bacilli *by systematic preliminary treatment with human tubercle bacilli alone*, and in which the immunity of animals so treated was measured with that of untreated animals, then a claim may be entered by Pearson and Gilliland* for their work published in 1902.

To von Behring, unquestionably, belongs the credit for first proposing a definite method for the practical application of vaccination of cattle against tuberculosis. This method, however, had not been tested before it was proposed, and has since been modified by von Behring in some particulars, and even now, after three years, there is still an amazing dearth of experimental proof of its efficiency.

The work that has already been done upon the subject of immunity against tuberculosis is conclusive upon some points, while upon others there is still need for prolonged, careful experimentation. It has been shown by appropriate treatment with tubercle bacilli non-virulent for cattle that cattle may be immunized against inoculations with fatal doses of virulent bovine tubercle bacilli. As has been pointed out by von Behring, it does not necessarily follow that, because it is possible to protect animals against the harmful effects of artificial inoculation with virulent tubercle virus, such animals are necessarily protected against what may be termed natural infection resulting from long-continued exposure with diseased animals.

There appears to be no doubt that different cultures of human

* "Phila. Med. Journal," November 29, 1902.

tubercle bacilli have different immunizing values. Some, indeed, cannot be used at all for this purpose, because they are of high virulence for cattle; others are of such excessively low virulence, as a result of long-continued artificial cultivation, that they have lost almost all pathogenic power. Whether such cultures are as useful for immunization as cultures that are of higher virulence, but still not pathogenic for cattle, remains to be proved. There is also need for comparison between the immunizing value of fresh cultures and cultures that have been dried in vacuum and reduced to powder. Some observations appear clearly and strongly to indicate that the fresh cultures have higher immunizing value than those that have been kept for some time in a dry condition.

It has been shown that vaccination can be practised in such a way as to be entirely harmless to the vaccinated animals; that such calves grow and thrive quite as well as unvaccinated healthy calves of the same breed and age. On the other hand, vaccination is not always unattended by danger, as is shown by the statements of Casper and Marks in their reports upon the use of von Behring's vaccine.

Among the many important questions that it is still necessary to solve before vaccination can be made available for the protection of animals against tuberculosis on a large scale are those in relation to the shortest and most economical procedure that will give effective protection, and in relation to the duration of immunity. Von Behring has pinned his faith to the two-vaccination method with dried virus and a long interval between vaccinations. Under his direction a large number of cattle have been vaccinated in this way so that within a few years, if careful records are kept, and if these are published, there will be a large amount of evidence as to the efficiency of this system under diverse practical conditions.

The State Live-stock Sanitary Board of Pennsylvania is supporting investigations in which cultures of various degrees of

virulence are used for vaccination in different doses, with different numbers of repetitions and of different intervals between doses. This work is for the purpose of establishing comparisons between different methods of vaccinations in respect both to the amount of immunity produced and to the duration of immunity.

The question as to the duration of immunity is an exceedingly important one, and the practical value of the whole procedure will depend largely upon the results of experiments in relation to this factor. It has already been shown that immunity will continue for a year. To say, at the present stage of the work, that immunity will last during the entire life of an animal is to make a statement for which there is absolutely no experimental proof. The problem of immunity in tuberculosis is so different from that in relation to other diseases that have been studied in this regard that it is not safe to conclude that because immunity lasts for a number of years in relation to a given disease, therefore it will last for a number of years in relation to tuberculosis. Upon this point nothing but experimental evidence can be convincing or useful.

Modes of vaccination against tuberculosis, as illustrated by the experimental work that has been done on this subject, differ greatly in respect to the rapidity with which the vaccinations are made; that is, the length of the intervals between vaccinations. While the method now recommended by von Behring calls for the elapse of three months between vaccinations, it is to be observed that a very high degree of immunity has been produced by repeated injections at short intervals, and is shown by the work of Pearson and Gilliland, Neufeldt, Huttyra, and some of the earlier work of von Behring.

Artificial immunity is relative, not absolute. However highly vaccinated an animal may be against anthrax, blackleg, or rabies, it is still possible to infect that animal with the disease against which it has been vaccinated by using a sufficient quantity of highly virulent virus of that disease. Similarly, in vaccination

against tuberculosis it has been found that it is possible to infect vaccinated animals if a sufficiently large quantity of virus is used—witness the work of Hutyra. What is desired in practical vaccination is that the animal shall be protected against so much virus as it may acquire under natural conditions. It is evident, therefore, that only exposure under natural conditions can settle this point, because the amount of virus passing from a diseased to a healthy animal, and the frequency with which it passes, cannot be measured, and so these conditions cannot be duplicated by any process of artificial inoculation.

It is clear that a lower degree of immunity will suffice under some conditions than under others. As a tuberculous cow is dangerous to her associates in proportion to the stage and extent of her lesions, the amount of exposure and, therefore, the amount of immunity required to give adequate protection will be less in herds that are under careful physical inspection, and from which clinically diseased animals are removed, than in herds in which there are numerous highly diseased cattle. It may be, then, that a low degree of immunity, such as may be conferred by two vaccinations, or even by one, may suffice, if accompanied by careful herd hygiene. This, also, is an unsolved point and is one that requires careful investigation.

If the question were settled as to the efficacy of vaccination, and if the best method for the immunization of cattle had been agreed upon, it would still be necessary to determine the possible effect of the vaccination of cattle upon the health of the consumers of their products. While there is still some difference of opinion as to the extent to which the health of people is jeopardized by the consumption of the products of tuberculous cattle, there can be no difference of opinion as to the undesirability of feeding living human tubercle bacilli to the consumers of meat and milk.

It must be remembered that the vaccine that has proved to be so effective in immunizing cattle consists of living tubercle bacilli of

human type. If these organisms retain their life and virulence for a long time in the body of the bovine animal, and especially in the edible parts of the carcass, or if they are excreted through the udder, it will be seen that the vaccination of cattle may have a very direct relation to the production of tuberculosis in man. The importance of this side of the question has been referred to by Marks,* who asks that investigations be made to determine how long the living tubercle bacilli that are injected into the circulation remain alive and virulent, so that meat inspectors may be properly guided. Few observations have been made upon this point. There are, however, two which merit consideration.

De Schweinitz and Schroeder† treated a cow as follows:

1902, July 19: 10 c.c. "moderately virulent" human tubercle culture intravenously.
 Aug. 6: 10 c.c. human tubercle culture intravenously.
 Aug. 20: 10 c.c. human tubercle culture intravenously.
 Sept. 20: 10 c.c. human tubercle culture intravenously.
 Oct. 7: 10 c.c. human tubercle culture intravenously.
 1903, Aug. 6: Killed.

Upon post-mortem examination of this cow it was found that "the entire right lung was sprinkled with minute white nodules about 1 mm. in diameter." "The other organs and glands did not show tuberculous lesions, and while there were some circular, red patches in the mediastinal glands, guinea-pigs inoculated from these glands did not become tuberculous. Guinea-pigs inoculated from the lung of this animal died of tuberculosis, showing that there were still living tubercle bacilli in the lung tissue." This convinces the authors that "the presence of these living tubercle bacilli seem to be due, therefore, to the inoculation of the human culture and not to the infection which the animal

* *Loc. cit.*

† "Proceedings of the American Public Health Association," 1903.

might possibly have gotten from the diseased animals in the stalls to which it has been exposed. . . . The results of this single experiment do not seem to be very encouraging. While the animal treated with the human germ was apparently resistant to the bovine disease, at the same time the human germ which had originally been injected was still persistent in the animal's system and was probably fairly widely distributed."

In relation to this case, Schroeder and Cotton* remark: ". . . . If the lesions are attributed to the immunizing injections, it is clearly shown, by the death of the guinea-pigs injected with fragments of the lung, that living tubercle germs were still present ten months after the last injection was made, a condition which certainly is very objectionable in a method which has for its primary object the prevention of tuberculous disease. While there is no desire on the part of the writers to urge or support the views of Koch and Smith with respect to the difference between the human and the bovine tubercle bacilli, to which we are really opposed, it seems, nevertheless, in the present unsettled state of the question, that we should not make cattle a repository for human tubercle bacilli in order to protect them from bovine tuberculosis." De Schweinitz and Schroeder† also remark: "The practicability of such a method as applied to animals that are to be used as food, or for the purpose of producing milk, is questionable, as it is apparently impossible to say how long the human tubercle bacilli may remain alive."

The other observations of interest in this connection are recorded by Karlinski,‡ who made upon goats a series of experiments for the purpose of determining the resistance of the goats of Bosnia to injections of human tubercle bacilli. Most of these experiments consisted in the intravenous inoculation of pregnant goats with human tubercle bacilli for the purpose of determining

* "The Twentieth Annual Report of the Bureau of Animal Industry," 1903, pp. 65, 66.

† *Loc. cit.*

‡ "Zeitschrift für Thiermedizin," p. 401, 1904.

the action of such bacilli administered in this way upon such goats and their progeny. For these experiments four cultures were used: two were obtained from human sputum, one was obtained from the kidney of a tuberculous man, and the origin of the fourth is not stated.

In this series of experiments twenty-two goats were inoculated intravenously; each received but one inoculation, consisting of from 0.01 gm. to 0.3 gm. tubercle bacilli. After the birth of the kids examinations were made of the milk of the mother goats. The milk was centrifuged and examined microscopically. Tubercle bacilli were found in the milk of seven goats, and the kids fed upon the milk of these goats became infected with tuberculosis. All the inoculated goats were infected with tuberculosis, and upon post-mortem examination lesions were found in the lymphatic glands and in a few instances in the lungs. The goats were inoculated from four to six months before the birth of their young. No clinical alterations or post-mortem lesions were at any time apparent in the udder of five of these animals that produced infectious milk, while in the other two there were lesions of tuberculosis in the udder.

These observations are sufficient to justify the exercise of great care in the application of vaccination. For the present, surely, the use of vaccination should be reserved for young cattle that will not come into milk, and that will not be slaughtered for use as food for a long time after vaccination.

It should, however, be remarked in connection with the above observation of de Schweinitz and Schroeder and of Karlinski that the cultures used for the inoculation of these animals were pathogenic for them, and must have been of rather high virulence.

It would be interesting to have more complete data in regard to the culture used by de Schweinitz. It is recorded, merely, that it was a human culture "moderately virulent." Cultures of tubercle bacilli from man differ enormously in their virulence for

animals. The English Royal Commission on Tuberculosis has found that one-third of all the cultures that they have isolated from cases of human tuberculosis are virulent for cattle and are capable of producing fatal disease. The German Tuberculosis Commission of the Imperial Health Office (Kossel, Weber, and Heuss)* reports that 14 % of the cultures of tubercle bacilli that they have isolated from man are virulent for cattle and are capable of producing fatal disease. Ravenel† has isolated three cultures of tubercle bacilli from children that are virulent for cattle, and Febinger and Jensen‡ have found that a considerable proportion of the cases of tuberculosis of man that they have studied are caused by organisms virulent for cattle. DeJong§ and several others have also isolated cultures that are of high virulence for cattle.

It is, therefore, clear, as has been remarked before in this paper, that great care must be taken in the selection of the culture to be used for immunizing purposes. An effort must be made to gain immunity by the use of a culture that is not pathogenic for cattle, even when used in enormous dosage, and that is quite incapable of producing progressive lesions. If an exceedingly attenuated culture of human type can be found that has lost its virulence for such a susceptible animal as the guinea-pig, but that is capable of conferring upon cattle immunity against bovine tubercle bacilli, this would furnish the safest and best vaccine material.

With relation to Karlinski's experiments, it should be observed that all his goats were infected with tuberculosis. In vaccination it is not proposed to infect in the sense of producing specific

* "Tuberkulose Arbeiten aus dem kaiser. Gesundheitsamte," Heft 1, 1904, and "Aufzeichnungen über die Sitzung des unterausschusses für Tuberkulose," June 25, 1904.

† "Philadelphia Med. Journal," July 21, 1900; "Proceedings Pathological Society of Philadelphia," new series, vol. v, 1902.

‡ "Berlin. klin. Wochenschrift," No. 38, 1902, and Nos. 6 and 7, 1904.

§ "La Semaine Médicale" No. 3, 1902.

lesions, but rather to guard against such a result. It is evident from these and other experiments that goats are quite susceptible to the action of human tubercle bacilli. If it is proposed to vaccinate goats, an unusually attenuated strain of tubercle bacilli of human type should be employed—one that is incapable of producing definite tubercles in the animal that it is designed to protect.

If no infection is caused and immunity is produced, there appears to be no valid ground for objection to the use, as food, of the production of immunized animals after the living bacilli injected have disappeared. Indeed, it may be, as Maragliano has suggested, that such foods will serve to increase the resistance to tuberculosis of those who use them. But one must be sure that no infection is produced, and must ascertain when the organism disappears.

Since it has been found that certain antitoxins are excreted in the milk of immune animals, and that these substances may pass unaltered through the wall of the digestive canal, some have ventured to hope (and Maragliano claims to have some experimental proof that such is the case) that it may be possible, by feeding the milk of cows immune to tuberculosis, to produce increased resistance to infection by tubercle bacilli. The problem that has been suggested is interesting, but as yet there are so few experimental data in relation to it that no estimate as to its effects can be reached.

The work that has thus far been done upon the immunization of cattle is sufficient to justify the most sanguine expectations. The absolute proof that has been furnished that cattle may be rendered highly immune to tuberculosis by a process that is not harmful to them constitutes a long forward step. If a practical and safe method for applying immunity shall be devised, as now seems probable, the result cannot but be of great advantage to agriculture and to the public health.

LEONARD PEARSON.

CLINICAL REPORTS ON THE USE OF MARAGLIANO SERUM.

REPORT ON TWO CASES TREATED WITH SERUM, COM- PARED WITH THREE CASES TREATED WITHOUT SERUM.

Five patients are here reported on. All received the ordinary treatment of the Institute. Two in addition to the ordinary treatment received Maragliano serum hypodermically. Both the serum cases were quite advanced and somewhat acute. Of the three cases that were not treated with the serum, one was so far advanced as to be absolutely hopeless; the other two were moderately good cases.

Comparison of Gain in Weight.—One serum case had been in the hospital for six months previous to beginning injections and was already at a pretty high weight; the other entered the hospital only at the beginning of injections at a low weight. The former gained one pound, the latter, three pounds. Of the other three cases, one had been in the hospital for some time, and being a very advanced case, lost weight continuously, while the other two entered the hospital in the midst of the serum injections, and being reasonably good cases and low in weight, naturally gained in weight.

Case No. 1694. Serum case. Highest weight, two and one-half years ago at the White Haven Sanatorium, one hundred and twenty-seven pounds; ordinary weight, previous to that time, ninety-eight pounds; lowest weight, before entering Phipps Institute, ninety-eight pounds; weight on entrance, 9—25—'04, ninety-five and one-half pounds. She gradually gained in weight until 11—8—'04, when she weighed one hundred and one-fourth pounds. At

the end of injections on 12-1-'04 she weighed ninety-nine and one-half pounds, and on 1-31-'05, ninety-nine pounds.

Case No. 1975. Serum case. Highest weight in 1900 one hundred and twenty-five pounds; 1-12-'04, one hundred and seven pounds; on admission to Phipps Institute, 2-16-'04, one hundred and three pounds. He gained in weight slowly but constantly until 9-12-'04, when injections were begun, and he weighed one hundred and eighteen pounds. On 11-11-'04 he reached one hundred and nineteen and one-fourth pounds. At the end of injections, on 12-1-'04, he weighed one hundred and twenty pounds, and on 1-31-'05, one hundred and twenty and three-fourth pounds.

Case No. 2799. Non-serum case. Highest weight unknown, but he lost weight before entrance into the Institute. On entrance, 11-7-'04, he weighed one hundred and ten and one-half pounds. He gradually increased in weight until 12-1-'04, when he weighed one hundred and fourteen and three-fourth pounds, and on 1-31-'05, one hundred and twenty-seven and three-fourth pounds.

Case No. 388. Non-serum case. Highest weight in 1900, one hundred and fifty-two pounds; lowest weight before entrance into Institute, one hundred and twenty-four pounds; on admission into Institute, 10-19-'04, one hundred and eleven and one-half pounds. On 12-1-'04 he weighed one hundred and twenty pounds; 1-31-'05, one hundred and twenty-eight and one-fourth pounds.

Case No. 2388. Non-serum case. Highest weight in 1894, one hundred and sixty-five pounds; on admission into Institute, 6-7-'04, one hundred and twenty-nine and one-half pounds; 9-25-'04, one hundred and seventeen and three-fourths pounds; 12-1-'04, one hundred and six and one-half pounds; later he was too weak to be weighed.

As is evident, the two serum cases remained at practically the same weight during the period of injections. Of the three non-serum cases, the far-advanced one lost weight continuously, while the two moderately early cases gained in weight. The serum injections appeared, therefore, to exercise no influence on the weight.

Comparison of Improvement in Regard to Tubercle Bacilli in Sputum and in Physical Signs.—All the cases showed tubercle bacilli in the sputum from the beginning to the end of observation. The two serum cases were considerably less advanced than one of the non-serum cases, and more advanced than the other

two. The only one of the five cases that showed improvement in physical signs was one of the serum cases. He showed a decided clearing up of the percussion-note. From the time this patient (No. 1975) entered the hospital this note cleared up somewhat, but it cleared up most during the time of injections. The other serum case showed advancement.

Comparison of Pulse, Temperature, and Respiration.—Case No. 1694. Serum case. The temperature showed nothing that might be the result of the injections. It fluctuated between 96° and 101.2° ; only four times did it reach 101° , and usually this elevation was accounted for by symptoms of cold. Nine times it went under 97° . The usual variation was between 98° and 100° , and for considerable periods it remained between 98° and 99° . The pulse remained at the same level throughout, fluctuating between 100 and 120.

The highest respiration during the first week of injections was 32, and it fluctuated between 22 and 32. During the second week it rose to 36 almost every day; during the third week to 40 every day; in the fourth week it reached 45 twice; seventh week, 45 six times and 40 daily; eighth week 32 as the lowest point, and an average of 41. During the ninth week it was not quite so high. For the tenth week the average was about 39; the eleventh and twelfth weeks about the same. In other words, there was a rise in the respiration from about 30 to 40.

Case No. 1975. Serum case. The temperature, pulse, and respiration showed no change from the beginning to the end of injections.

Case No. 2799. Non-serum case. Temperature November seventh to twentieth, 97° to 98° ; November twenty-first, 103° , and for five days 98° to 100° ; this was accounted for by a cold. Pulse remained about 100 throughout, except November twenty-first, when it was 120. Respiration showed nothing worthy of mention.

Case No. 388. Non-serum case. From October nineteenth to December third the temperature was 97° to 99.2° , except rarely, when it went to 100.4° . Pulse from October nineteenth to thirtieth, 98; October thirty-first to November third, 120; November third to twenty-sixth it varied from 100 to 116; after November twenty-sixth and all during month of December, 100. Respirations October nineteenth to November eighth, 24; November eighth to fourteenth, varying up to 30, followed by a return to 24 and a gradual rise to 32 on November twenty-third; November twenty-third to end of December about 36.

Case No. 2388. Non-serum case. Temperature September eighteenth

to October ninth, 98° to 100°, when it rose to 102°, due to a cold; November first, 101°; November sixth, seventh, twenty-second, twenty-fifth, and twenty-ninth, 101°; all other times, 97° to 100°. Pulse before September nineteenth, varied from 100 to 140; after September nineteenth to December first, 100 to 120—usually between 100 and 110. Respiration before September nineteenth, varied from 30 to 48; from September nineteenth to December first, 28 to 34, except once 36, and once 42.

Incidents in the Course of the Injections.—Case No. 1694. The injections were made subcutaneously on either side of the spinal column alternately, and between the lumbar region and the spine of the scapula. They were given as follows: September twenty-second, twenty-sixth, twenty-eighth, thirtieth, October second, tenth (this intermission between October second and tenth being due to local symptoms about the sites of injection and a general urticarial rash), twelfth, fourteenth, sixteenth, eighteenth, twenty-fourth (the intermission between October eighteenth and twenty-fourth being due to diminished elimination of urine for several days and frequent weak spells), twenty-sixth, twenty-eighth, thirtieth, November first, sixth, eighth, tenth, twelfth, fourteenth, sixteenth, eighteenth, twenty-first, and twenty-third, when they were practically stopped because the patient appeared to be getting gradually worse with more frequent morning weak spells. One injection was given eleven days later, on December fourth, making in all twenty-seven injections.

Following the second and third injections there was a small hemorrhage from the wound made by the hypodermic needle. Each of the first three injections was followed by a local ecchymosis which disappeared in twenty-four hours. The second to the sixth injections were followed by an inflammation evidenced by hyperemia, swelling, heat, and soreness. These areas of inflammation were about two and one-half inches in diameter. The day after the sixth injection a wide-spread urticarial rash in the form of papules appeared on the face, both forearms, back, and left side. This urticaria and the local inflammation disappeared in about three days.

Following the fifth injection the glands in the left axilla were found slightly enlarged, tender, and painful; on the following day the same condition occurred in the right axilla. The pain and tenderness in these glands disappeared in two or three days, and the enlargement became less marked; the glands remained evidently enlarged, however, throughout the course of the injections.

Two days after the sixth injection the patient had an attack of weakness, manifested by extreme prostration, weak pulse, and nausea. She felt as if she

were about to die. Though she never had had such an attack before, from this time on she complained of having one frequently. Sometimes she had two in one day, again one a day for several days in succession. No interval of a week passed without such an attack. On account of the livid inflammation, the general urticarial rash, the painful enlargement of the axillary glands, and the weak spells no injections were given from October second to October tenth.

At the time for the twelfth injection (October twentieth) the weak spells had become quite frequent (occurring almost daily) and the elimination of urine appeared to be decreasing; consequently injections were intermitted from October eighteenth to October twenty-fourth. The quantity of urine in twenty-four hours had been usually over sixty ounces, but on October sixteenth it was fifty ounces; October seventeenth, thirty-seven ounces; eighteenth, forty-six ounces; twentieth, forty-six ounces; twenty-first, forty-one ounces, and though this could not be called low, the decrease was noticeable. Later considerations led me to believe that this decrease was accidental and had nothing to do with the injections. Three times in the course of the injections symptoms of a slight cold manifested themselves, but disappeared without incident in two or three days.

Case No. 1975. From September twelfth to November twenty-third this patient received an injection of Maragliano serum every second day, with one exception, namely, during an intermission of six days between October sixteenth and twenty-fourth on account of the elimination of urine being low (October fifteenth, thirty-two ounces; October sixteenth, twenty-six ounces; October seventeenth, twenty-three ounces; October eighteenth, twenty-seven and one-half ounces). He received in all thirty-three injections. Following the third injection there was enlargement of the axillary glands, which became painful and tender to touch. Following the fourth injection the patient complained of headache and pains in the joints, especially the elbows and knees, and these two joints became somewhat red and swollen and surrounded by an urticarial rash. The temperature rose to 100°. At this time the patient's throat was quite red, so that the pains in the joints may have been due to an acute cold. All the symptoms gradually subsided, and except the enlargement of the axillary glands, disappeared entirely in two or three days.

On October tenth there was slight gastric disturbance, with increase in cough and expectoration, followed by intense headache on October fifteenth; but by October twentieth this disturbance, apparently due to a cold, had disappeared.

On October twenty-fifth, immediately after an injection (within two minutes), the patient was seized with nausea, extreme weakness, and appeared

about to faint. This attack (the first of its kind he ever had) lasted about five minutes.

The Blood.—Case No. 1694. Injections were begun on September twenty-second. The blood was examined for the first time on September twenty-ninth, 11.30 A. M., and showed: R. B. C., 5,000,000; W. B. C., 15,120; H., 80. Differential count showed: Small lymphocytes, 15 %; large lymphocytes, 9 %; transitional cells, 3 %; neutrophiles, 84 %; eosinophiles, 5 % (altogether two hundred and thirty-three cells counted). There was no injection on the twenty-eighth and none on the twenty-ninth of September. On October sixth, 3 P. M. (no injection having been given since October second), W. B. C., 17,680.

October fourteenth, 9 A. M., before injection: W. B. C., 18,600 (two counts). On the same day noon, before dinner, three hours after injection: W. B. C., 16,960. Same day 4 P. M., W. B. C., 15,040. Nourishment for the day: 6 A. M., one cup of milk; 7.30 A. M., one cup of milk; 10 A. M., two cups of milk and two eggs; 12 o'clock, two cups of milk and one banana.

October twenty-eighth, 9 A. M., before injection: W. B. C., 8880. Same day noon, before dinner, three hours after injection: W. B. C., 11,440. Nourishment: 7.30 A. M., two cups of milk, two eggs, and a piece of toast; 10 A. M., one cup of milk and two eggs.

October twenty-ninth, 9 A. M.: W. B. C., 12,000. On the same day noon, before dinner: W. B. C., 12,680; no injection. Nourishment: 7.30 A. M., one cup of milk and a piece of toast; 10 A. M., two cups of milk.

November sixth, 9.15 A. M., before injection (last injection three days previously): W. B. C., 14,400; and again by a different count from a different finger, W. B. C., 14,960. Small lymphocytes, 19 (5 %); large lymphocytes, 42 (10 %); transitional cells, 15 (4 %); neutrophiles, 303 (75 %); eosinophiles, 14 (3.5 %).

On the same day at noon, three hours after injection: W. B. C., 14,480. Small lymphocytes, 25 (8.33 %); large lymphocytes, 43 (14.33 %); transitional cells, 7 (2.33 %); neutrophiles, 224 (74.66 %); eosinophiles, 6 (2 %). Nourishment: 7 A. M., two eggs and one cup of milk; 10 A. M., two eggs and one cup of milk. In other words, twice out of three times the blood failed to show leucocytes due to the injections.

Case No. 1975. The blood was examined on September twenty-eighth and showed: R. B. C., 5,400,000; W. B. C., 14,800; H., 85 %.

Differential count showed: Small lymphocytes, 5 (2.8 %); large lymphocytes, 35 (19.6 %); transitional cells, 5 (2.8 %); neutrophiles, 124 (71.8 %); eosinophiles, 5 (2.8 %); R. B. C. showed a normal amount of H. October

seventh, at noon, just before dinner: W. B. C., 15,120. There was no injection on October seventh, the injection day being the day before and the alternate days previously.

October fourteenth, 9 A. M., before injection: W. B. C., 12,990 (two counts). On the same day at noon, before dinner, three hours after injection: W. B. C., 16,080. The nourishment for that day was as follows: 6 A. M., one cup of milk; 7.30 A. M., two cups of milk and two eggs; 10 A. M., one and one-half cups of milk. October twenty-eighth, 9 A. M., before injection: W. B. C., 9520. On the same day at noon, before dinner, three hours after injection: W. B. C., 14,000. Nourishment for the day: 7.30 A. M., two cups of milk and two eggs; 10 A. M., two cups of milk and two eggs.

October twenty-ninth, 9 A. M.: W. B. C., 14,260. On the same day at noon, before dinner (no injection): W. B. C., 12,960. November third, 9 A. M., before injection: W. B. C., 8120. Differential count showed: Small lymphocytes, 25 (10 %); large lymphocytes, 33 (13.2 %); transitional cells, 5 (2 %); neutrophiles, 165 (66 %); eosinophiles, 20 (8 %). On the same day at noon, before dinner, three hours after injection: W. B. C., 12,800. Differential count showed: Small lymphocytes, 14 (4.66 %); large lymphocytes, 70 (23.33 %); transitional cells, 13 (4.33 %); neutrophiles, 180 (60 %); eosinophiles, 20 (6.66 %). Nourishment: 6 A. M., one cup of milk; 7.30 A. M., two cups of milk and two eggs; 10 A. M., three cups of milk and two eggs.

Each single injection of the serum appeared to bring about an increase of about 4000 in the W. B. C.; though this increase always disappeared before the next injection. No permanent leucocytosis was therefore produced. From the one comparative differential count made, the increase appeared to be in the large lymphocytes.

Urine.—Case No. 1694. The first examination on September twenty-fifth showed: acid, 1024, no sugar, no diazo, a slight trace of albumin (by the heat and acetic-acid test), a few hyaline casts, and numerous flat epithelial cells. It was examined daily, except during menstruation, from this time until December first. Four times for a period of several days at a time a trace of albumin was found, but this apparently had nothing to do with the injections. The other constituents remained the same. There was no decided variation in the quantity except as previously mentioned.

Case No. 1975. At the beginning of the injections the urine was acid, 1020, showed no albumin, no sugar, no diazo reaction, a few hyaline and waxy casts, and small round epithelial cells. On October twenty-third (a month after injections had been begun) it showed a slight trace of albumin. This trace occurred off and on until the end. Although the urine lessened in quantity for a few days in October, it increased again and remained normal.

COMPARISON OF THE SERUM CASES WITH THE NON-SERUM CASES.

No.	AGE, SEX, COLOR.	OCCUPATION.	DATE OF ADMISSION.	DURATION OF TREATMENT IN INSTITUTE.		DURATION OF DISEASE.		HEMORRHAGE.	COUGH.	HOARSENESS.	DIARRHEA.	SWEATS.	DYSPEPSIA.	WEIGHT.			LIVER, SPLEEN, THYROID, KIDNEY.	TUBERCULAR BACILLI.	TEMPERATURE.		PULSE.	GENERAL APPEARANCE.	PHYSICAL SIGNS AT END OF YEAR.
				Weeks	Years	According to Patient.	According to Physician.							On Admission.	Highest.	Usual.			Usual.	Highest.				Usual.
1604*	30 F. W.	(1)	9 25 '04	16	14	14	+	+	+	—	—	—	+	95½	127	100½	Normal.	+	100	100	120	Emaciated, hectic.	1—19—'05: Physical signs the same, except no signs of cavity, the tympany being replaced by dullness.
1975*	27 M. W.	(2)	2 16 '04	52	2½	3	+	+	+	—	—	—	+	103	125	125	Normal.	+	100	100	110	Hectic, otherwise pretty good.	1—19—'05: Examination showed the same.
2799	45 M. W.	(3)	11 7 '04	12	1	2	—	+	+	+	—	+	+	110½	†	†	Normal.	+	98½	100	120	Good; not emaciated; not hectic.	1—31—'05: Signs have not changed.
388	28 M. W.	(4)	10 19 '04	6	3½	3½	—	+	+	—	—	+	—	111	152	143	Normal.	+	98	100	120	Hectic, otherwise pretty good.	1—31—'05: Same.
2388	43 M. W.	(5)	6 7 '04	20	9	9	+	+	+	+	—	+	+	120½	165	155	Normal.	+	99½	100	120	Pale and emaciated, but not hectic	1—31—'05: All signs increased.

* Serum cases. † Unknown (1) Paper-box maker. (2) Grocery clerk. (3) Baker. (4) Weaver. (5) Plasterer.

Local and General Effects Directly Attributable to the Serum.—

From a comparison of these cases we might draw the following conclusions:

- (1) The serum does not by itself produce a gain in weight.
- (2) As far as the lung involvement is concerned, one case which had been improving already apparently improved, the other showed no improvement, consequently nothing can be drawn from it.
- (3) The serum had apparently no influence on cough or expectoration or the presence of tubercle bacilli.
- (4) Pulse and temperature underwent no change; respirations in one case increased in number.
- (5) The serum usually brought about an increase in the white blood-corpuscles, though this increase was temporary; twice out of the three times in which the blood was counted in the female a leucocytosis was not found.
- (6) The serum may have a possible influence on the production of albumin in the urine which occurred in the male a month after injections were begun.
- (7) In the female no effect on menstruation was noted.
- (8) The serum produces an enlargement of the lymphatic glands nearest to the site of injection.
- (9) The serum produces local inflammation and sometimes a general urticaria.

JOSEPH WALSH.

MARAGLIANO SERUM.

REPORT ON TWO CASES TREATED WITH SERUM, COMPARED WITH SEVEN CASES TREATED WITHOUT SERUM.

In order to obtain an accurate knowledge of any method of treatment for tuberculosis all factors having an influence upon the progress of the disease must be borne in mind. Comparison must be made between cases under the same conditions as to diet, hygiene, and medication. In the cases here reported, having been treated side by side in the same ward, such influences were the same in all and need not be discussed in this connection. Other factors of importance bearing upon treatment are:

1. Degree of involvement.
2. Duration of the disease.
3. Age of the patient.
4. Complications.
5. Temperament and self-control of the patient.
6. Height and variation of the temperature.
7. Rapidity of the pulse.

The influence of the amount of involvement is patent to all. This, combined with a knowledge of the duration of the disease, allows of an opinion as to the degree of resistance of the individual and the virulence of the infection. The age of the patient is important, as the recuperative power is usually greater in the young than in those of a more advanced age. The effect of complications, such as pleurisy, influenza, etc., is too well known to require discussion. The influence of the temperament and self-control is very great. Where there is an extreme degree of nervousness we are, perhaps, justified in assuming some degree

of acuteness. At least, the slow, chronic cases are less apt to show marked nervousness than are the acute cases. From the height and variation of the temperature we gain an idea of the probable amount of secondary infection; also, too, of the amount of toxin present. Any conclusion drawn must depend not only upon the gain in weight, but also upon improvement in the pulmonary condition. This improvement, in advanced cases, is necessarily slight, and judgment as to the amount must depend entirely upon the observer.

The cases here reported upon are nine in number. All received the ordinary treatment of forced diet of milk and eggs, regulated exercise, and as much fresh air as possible. In addition to this two received Maragliano serum hypodermically. One of the serum cases was very far advanced, with diazo reaction in the urine. The serum in this case was discontinued after eleven injections. This case will be discussed separately later on. Of the eight remaining cases, one was a boy of thirteen with widespread disease and the other a man of over fifty with bilateral involvement and a dilated heart. The remaining six, though representing very varying degrees of involvement, permit of comparison in many ways. For obvious reasons the period of comparison is made in accordance with the serum case, though some of the patients had been in the hospital before the serum case came in and some remained longer.

Comparison of Gain in Weight.—Case No. 2691, a serum case, gained during the serum period twenty-one and one-half pounds. Six other cases, adults, gained during the serum period, on an average, fifteen and one twenty-fourth pounds, or, omitting case No. 2737, who was within a few pounds of normal, five adults during the serum period gained on an average sixteen and one-half pounds. It must be noted that case No. 2608 had gained eleven and one-fourth pounds and case No. 2632 had gained three pounds before the serum period began. Case No. 2813, who came into the Institute four weeks after the beginning of

the serum period, gained sixteen and one-half pounds during this period, and in his eight weeks' stay gained twenty and one-fourth pounds. The serum case, No. 2691, gained six pounds in the three weeks preceding the beginning of the injections. The boy, No. 2674, gained six and one-half pounds before the serum period, and during the period gained eight and one-half pounds. It will be noted that the gain in weight is most rapid during the first three months. From the weight tables it is apparent that gain in weight occurred as rapidly and to as great a degree in the non-serum cases as in the serum case.

Comparison of Improvement in Physical Signs.—Besides the serum case, only one other patient, No. 2813, was without one or more cavities. In both of these cases tubercle bacilli were not demonstrable in the sputum at the time of discharge. No. 2813, the non-serum case, was an earlier stage case than No. 2691, the serum case. The latter showed improvement in cough and expectoration, but there were still râles in his chest on discharge. So far as the pulmonary condition is concerned, case No. 2691 showed no more, or perhaps a little less, improvement in physical signs than cases Nos. 2608 and 2727, both of whom showed bacilli in the sputum on discharge.

Comparison of Pulse and Temperature.—Case No. 2691, serum case, showed on discharge an evening rise of 99° , as did the others with the exception of No. 2813, whose temperature was normal, and No. 2737, who had an evening temperature of 100° to 101° . The pulse was a little elevated in all except case No. 2813; particularly so in Nos. 2727 and 2737.

Case No. 2676, a serum case, deserves special mention. A far-advanced case, he lost seven pounds during eleven injections of serum. The serum was accordingly stopped. He then gained slightly in weight for a short time and subsequently lost steadily. The chief point of interest in this case is the great prolongation of life in the presence of signs which indicated an early death.

Local and General Effects Directly Attributable to the Serum.—

The injections were of 1 c.c. each, given on alternate days, in the region between the lower rib and the crest of the ilium posteriorly. There was only a slight amount of pain. In case No. 2691 the first injection caused a rise in temperature to 100.4°. Subsequent injections had little or no effect on the temperature. Following the second injection, the patient complained of slight pain in the groin, the glands of which were a little enlarged. This disappeared in a short time. During the fourth week of injections he complained of pain in one knee lasting a few days, and around the site of one injection there were a few herpetic vesicles which were itchy. No other local phenomena were noted. The urine showed no abnormality, though examined daily. The blood showed a slight leucocytosis as a result of the injections. In case No. 2676 absolutely no local symptoms resulted from the injections.

From a comparison of these cases certain preliminary conclusions may be drawn:

(1) Gain in weight occurs as rapidly and to as great an extent in cases not treated by serum as in those treated.

(2) Considering the stage of the disease, improvement in the pulmonary symptoms is as great in cases not treated with serum as in those treated.

(3) Cough and expectoration lessen to as great a degree in cases untreated with serum as in those treated.

(4) No special effect of serum upon pulse and temperature could be noted.

(5) In one advanced case with diazo reaction in the urine the use of serum was accompanied by a rapid loss in weight.

(6) It remains to be proved that cases treated with serum show a lessened tendency to relapse or reinfection than cases not so treated.

(7) As far as it is possible to judge from so limited an observation, the use of Maragliano serum is not indicated in cases of moderate or advanced degree.

COMPARISON OF THE SERUM CASES WITH THE NON-SERUM CASES.

No. SEX. AGE.	Color.	Occupation.	DATE OF ADMISSION.	DURATION OF TREAT- MENT (Weeks).	DURATION OF DIS- EASE.		Hemorrhage.	Cough.	Hoarseness.	Diarrhea.	Sweats.	Dyspnea.	WEIGHT.				LIVER, SPLEEN, THYROID, KIDNEY.	TUBERCLE BACILLI.	TEMPERATURE.		PULSE.	
					According to Patient.	According to Examination.							On Admission.	Highest.	Usual.	On 12-23-'04.			Usually Below.	Highest.	Usually Below.	Highest.
2608 M. 22	W.	(1)	8 10 8	18	9 mos.	7 yrs.	+	+	-	-	+	+	128½	150	145	159½	Norm	+	100	100½	110	130
2632 M. 24	W.	(2)	7 23 104	21	7 mos.	2 yrs.	+	+	-	-	+	+	134½	219	180	156½	Norm	+	100	101½	130	220
2674 M. 13	W.	(3)	8 16 104	18	13 yrs.	13 yrs.	+	+	-	-	+	+	67½	84	75	82½	Norm Liver Enl'g	+	99½	99½	116	180
2676 M. 40	W.	(4)	8 17 104	18	14 mos.	14 mos.	+	+	+	-	+	+	121	180	154	102½	Norm	+	101	102½	130	140
2691 M. 19	W.	(5)	8 17 104	15	3 wks.	3 yrs.	+	+	+	-	+	-	118	130	(*)	146½	Norm	+	100	100½	110	128
2727 M. 26	W.	(6)	9 21 104	13	1 yr.	2 yrs.	-	+	-	-	-	+	116½	136	136	133½	Norm	+	100	101½	110	120
2737 M. 20	W.	(7)	9 19 104	13	16 mos.	16 mos.	+	+	+	-	-	+	145	163	148	153	Norm	+	100½	105	110	120
2760 M. 50	W.	(8)	9 20 104	12	2 yrs.	2 yrs.	-	+	+	-	-	+	116½	160	150- 152	132½	Norm	+	99½	99½	110	128
2813 M. 35	W.	(9)	10 18 104	7	1 wk.	1 wk.	+	-	+	-	-	-	126½	151	136	146½	Norm	+	99½	100½	100	116

(1) Clerk; motorman one and one-half years. (2) Book-keeper for six years, not working one year. (3) Worked in printing office about one year. (4) Weaver.
 (5) Teacher. (6) Bag-sewer; soldier. (7) Plumber. (8) House-painter. (9) Printer. (*) Not noted.

CASES IN DETAIL.

Case No. 2608. Non-serum case. Physical signs on admission: *Right chest*: Flatness from fourth interspace anteriorly and scapular angle posteriorly down. This is movable. High-pitched, wooden tympany above, with amphoric breathing, whispered pectoriloquy, moist rales. *Left chest*: Slight dulness over apex with bronchovesicular breathing. No rales.

Condition and physical signs 12—23—'04: Appearance good; no pain; almost no cough; slight morning expectoration. Tubercle bacilli still present. *Right chest*: High-pitched, wooden tympany, amphoric breathing but no rales over right upper lobe. Slight dulness at base, not movable. Breath and voice sounds not well heard. *Left chest*: Slight impairment with prolonged expiration at apex, otherwise normal.

Remarks: The progress was uneventful. He had a slight cold during the treatment, and at times a little indigestion which was of short duration. The pain in the chest subsided under blisters and the effusion was absorbed. He was discharged improved, to report to the dispensary.

Case No. 2632. Non-serum case. Physical signs on admission: *Right chest*: Anterior—dull over upper lobe. Bronchial breathing and a few rales. Posterior—tympany above ridge of scapula with amphoric breathing, pectoriloquy, and rales. Below the ridge the percussion-note was fair; the breathing harsh; there were numerous rales. *Left chest*: Anterior—hyperresonance everywhere, extending beyond the sternum and displacing the heart to the right. Motion, fremitus, breath and voice sounds diminished. No coin test; no splash. Movable dulness over lower part of the chest.

Physical signs, 12—23—'04: *Right chest*: Anterior—hyperresonance to fifth rib; dull to ninth rib, with pectoriloquy and almost amphoric breathing under clavicle. Posterior—dull over scapula, with amphoric breathing and pectoriloquy; no rales. Below the scapula hyperresonance, harsh breathing, no rales. *Left chest*: Anterior—tympany to third rib, dulness below that. Amphoric breathing, rales, and pectoriloquy above third rib; no sounds below that. Posterior—dull throughout. Amphoric breathing to spine of scapula, with rales and pectoriloquy. Below that the breath sounds are faint and distant. Dulness movable.

Remarks: On 8—5—'04 the patient had a typical attack of left-sided pneumothorax which was a duplicate of one occurring six weeks previous, according to the patient. This gradually disappeared and the fluid increased;

the patient gained in weight and strength up until 12-23-'04, when he was still in the hospital. Tubercle bacilli then were still present.

Case No. 2674. Non-serum case. Physical signs on admission: *Right chest:* Dull over upper lobe anteriorly and posteriorly with bronchial breathing and whispering pectoriloquy, but no rales. Below the third rib and the spine of the scapula hyperresonance with harsh breathing. No rales. *Left chest:* The same except that the pectoriloquy is less marked and doubtful.

Physical signs, 12-23-'04: The same as before except that the cough and breathing have improved and the weight has increased.

Remarks: The course of the disease was uneventful.

Case No. 2676. Serum case. Physical signs on admission: *Right chest:* Anterior—relative dullness to fourth rib; flat below that; breathing harsh. No rales. Posterior—dull to midscapula, then resonant for a hand-breadth, then flat. Breath-sounds feeble and distant. No rales. *Left chest:* Dullness over upper half of upper lobe anteriorly and posteriorly with moist rales. Bronchial breathing, increased resonance, and fremitus. Below that hyperresonance and harsh breathing. No rales.

Physical signs, 12-23-'04: *Right chest:* No change. *Left chest:* Rales over entire upper lobe anteriorly and posteriorly. The lower half of upper lobe is now dull and tender; the breath-sounds are inaudible. In the upper half of the upper lobe there is hyperresonance now with rales as before. The lower lobe is still hyperresonant. No rales.

Remarks: Serum was begun 9-20-'04. Eleven injections of 1 c.c., on alternate days, were given. The condition grew worse. The patient complained of sleeplessness and loss of appetite. In three weeks he lost seven pounds. There was no local reaction from the serum and no subjective symptoms. After omission of serum he gained in weight for a short time, then again failed. The special point of interest is the prolonged duration of what was an active disease and far advanced.

Case No. 2691. Serum case. Physical signs on admission: *Right chest:* Slight impairment over apex with prolonged expiration; increased resonance and fremitus but no rales. *Left chest:* Dullness over the entire upper lobe anteriorly and posteriorly. Normal below upper lobe anteriorly. There was bronchial breathing to the third rib, with increased fremitus and resonance. Below the third rib the sounds were faint. In the fourth and fifth interspaces, between the nipple and anterior axillary line, there was an area of blowing breathing and whispering pectoriloquy. No rales.

Physical signs, 12-23-'04: *Right chest*: No change. *Left chest*: Breathing is better; more air enters lung; no pain; note more resonant. The area of blowing breathing and pectoriloquy is much less.

Remarks: Serum was begun 9-9-'04. Patient was given thirty-four injections, practically always on alternate days, and in all except three instances was given 1 c.c. The first injections were followed by a rise of temperature, but this soon diminished, the temperature averaging 99° in the evening. On 9-21-'04 there was slight swelling in the glands of the right groin. On 9-30-'04 he had a slight cold; herpes on lips. On 10-5-'04 he had pain in the knee, which lasted three days; no physical signs; no elevation of temperature. On 10-10-'04 two or three herpetic elevations occurred around site of the injection which were itchy. On 10-24-'04 the cough had practically gone. On 11-4-'04 tubercle bacilli were not found. Sent to White Haven.

Case No. 2727. Non-serum case. Physical signs on admission: *Right chest*: Dulness to third rib anteriorly and to spine of scapula posteriorly. Bronchial breathing and greatly increased vocal resonance over this area. No rales. *Left chest*: Slight impairment of resonance over apex with prolonged expiration. No rales.

Physical signs, 12-23-'04: *Right chest*: Dulness as before to third rib anteriorly and to spine of scapula posteriorly, with hyperresonance below that. Over upper lobe there is bronchial breathing but no rales. Whispering pectoriloquy above the clavicle anteriorly, also above scapula posteriorly. *Left chest*: No impairment. Slight prolongation of expiration over apex. No rales. Practically no change.

Remarks: Course uneventful. He gained seventeen and one-half pounds. Cough almost absent. Tubercle bacilli still present in sputum.

Case No. 2737. Non-serum case. Physical signs on admission: *Right lung*: Dulness, retraction, diminished motion and fremitus to third rib anteriorly. Posterior—dull to midscapula and impaired below. Anteriorly, above, there were a few rales. Prolonged expiration and doubtful pectoriloquy. Breathing harsh below. Posteriorly the breathing was suppressed. Above the scapula there were a few rales and increased vocal resonance. Below there were no rales. Vocal resonance increased. *Left lung*: Apex impaired, with prolonged expiration. No rales.

Physical signs, 12-23-'04: Practically no change.

Remarks: This patient had shown distinct signs of cavity six months previous to admission, but gained so much that he was sent to White Haven.

COMPARATIVE WEIGHT TABLE OF SERUM CASES AND NON-SERUM CASES.

CASE No.	9-12-'04.	9-19-'04.	9-26-'04.	10-3-'04.	10-10-'04.	10-17-'04.	10-24-'04.	10-31-'04.	11-7-'04.	11-14-'11.	11-21-'04.	11-28-'04.	11-6-'04.	11-13-'04.	11-20-'04.	11-27-'04.	11-3-'04.	11-10-'04.	Gained in serum period, 14 pounds.
0608	144½	147½	147½	148½	152	150	153½	155	153½	155	159	159	159	159	159	159	159	159	Gained in serum period, 14 pounds.
0632	137½	138½	140½	140½	144½	144	144½	145½	146½	150½	151½	153	154	154½	154½	156½	158	159½	Gained in serum period, 14½ pounds.
0674	74	76½	76½	77	80	80½	80	82½	82	82½	82½	83½	83½	82½	82½	82½	82½	85½	Gained in serum period, 8½ pounds.
0676	120	N. W.	N. W.	116	113	Serum stopped. 114½	113½	116½	115	112½	110½	107½	106½	103½	103½	102½	..	..	Lost during serum injection.
0611	124	127	129½	132½	N. W.	136½	138½	140½	140½	143½	Serum stopped. 145½	146	146½	..	..	..	..	..	Gained in serum period, 21½ pounds.
727		116½	118	118½	122	124½	127½	128½	130½	133	133½	134½	134½	133½	135	130½	132½	..	Gained in serum period, 17½ pounds.
737		145	148½	156	151½	152½	154	153½	155	154	153½	152½	153½	153½	152½	151½	150½	151	Gained in serum period, 8½ pounds.
0760		..	116½	113½	119	121½	124½	125½	127½	128½	129½	130	130½	130½	132½	133	132½	133½	Gained in serum period, 16 pounds.
813	..	..	..	..	..	126½	129½	132½	134½	138	141½	143½	146½	..	..	..	..	..	Gained in two weeks less than serum period, 24½ pounds.

There he was in bed constantly, on account of high pulse and temperature. During the period reported upon he did fairly well, but the pulse and temperature remained high and the hoarseness persisted. Since that time he has done rather badly. Tubercle bacilli positive.

Case No. 2760. Non-serum case. Physical signs on admission: *Right lung*: Impaired over upper part of upper lobe anteriorly and posteriorly. Anteriorly there was harsh breathing with increased vocal resonance. No rales. Posteriorly, almost amphoric breathing over apex. No rales. Middle and lower lobes hyperresonant, with bronchovesicular breathing. *Left lung*: Tympany at apex with dulness to third rib anteriorly and to middle scapula posteriorly. Hyperresonance below. Above there were bronchial breathing, rales, and pectoriloquy; below, bronchovesicular breathing. Heart dulness enlarged to the right.

Physical signs, 12—23—'04: But little change in physical signs.

Remarks: There was slow but progressive improvement. He gained in weight. The cough and expectoration became less. Breathing continued rapid, becoming markedly so upon exertion. Temperature generally near normal. Tubercle bacilli positive.

Case No. 2813. Non-serum case. Physical signs on admission: *Right lung*: Slight impairment of right apex anteriorly and posteriorly, with bronchovesicular breathing; increased vocal resonance. No rales. Normal below. *Left lung*: Prolonged expiration at apex. No rales. Otherwise normal.

Physical signs, 12—23—'04: *Right lung*: Signs the same as they were, though less marked. *Left lung*: Normal.

Remarks: This patient was in good flesh on admission. He gave a history of excessive hemorrhage for a week preceding admission. It is curious that no rales were found in the chest. He was by far in the earliest stage of any of the group. His progress was rapid and uneventful. Cough and expectoration rapidly disappeared. No tubercle bacilli on discharge.

WM. B. STANTON.

MARAGLIANO SERUM.

REPORT ON ONE CASE TREATED WITH SERUM.

Case No. 1950. White. Age, twenty-eight. Single. Visited the dispensary of the Phipps Institute for the first time 1-6-'04.

Family history, negative. Individual history: Had had influenza, rheumatism, pneumonia, and typhoid fever, the last two occurring five years prior to admission. For the past eight years she has constantly visited a friend who had lung trouble. She was employed in a hosiery mill.

She believed herself in good health until two months before coming to the Institute. It seems probable, however, that the trouble dates back five years, when she first complained of occasional attacks of hoarseness. At her first visit she complained of cough, worse in the morning; considerable yellow expectoration; frequent attacks of nausea and vomiting, and chills. The menses were delayed, and for two months a leucorrheal discharge had been present. She had previously had pleuritis, pains on the left side, night-sweats, and some edema of the ankles.

Her height was five feet; her highest weight, one hundred and two pounds ten years previously; at the first visit her weight was ninety-two and one-half pounds. She was anemic and while thin, was not emaciated.

The first examination 1-6-'04, by Dr. Charles J. Hatfield, showed slight dulness with prolonged expiration and pleuritic friction-rub over the left upper lobe. Slight infiltration at right apex.

She was admitted to the wards of the Institute 1-14-'04. On admission to the wards her weight was eighty-eight pounds. The examination at this time showed dulness over the upper and middle lobes of the right lung, with slight dulness below. Over this entire lung the breath-sounds were distant, expiration was prolonged, and there were numerous fine crackling rales. The same condition existed over the upper part of the left upper lobe. In addition, on the left side there were several small patches of fine crackling rales which were not constant. This condition of the lungs remained practically unchanged from April, 1904, to February, 1905. At the time of admission the temperature was very irregular, ranging from 96° to 103°; the pulse varied from 100 to 138, and the respiration from 24 to 34. From the

time of admission to the beginning of the serum treatment the temperature gradually became lower, as did the pulse and respiration. During this period (2-1-'04 to 9-2-'04) her general improvement was gradual, although interrupted from time to time by attacks of diarrhea which lasted from three to seven days. At the time the serum was started, on 9-21-'04, her weight had increased from eighty-eight to one hundred and twelve pounds; her temperature for four weeks had averaged about 99.3°; her respiration had almost constantly been at 20, except after exertion; her pulse, on the whole, had been better, but still was subject to wide variations from 94 to 130. Prior to the use of the serum she had shown a trace of albumin and a few hyaline casts in her urine; the latter subsequently disappeared.

The first five injections of serum of 1 c.c. each were given in the interscapular region. Each injection was followed within twenty-four hours by a marked local reaction, consisting of a sharply margined area about the size of the palm of the hand. This area was hot, painful, and covered with small vesicles. The neighboring glands in the axilla became enlarged and very tender to the touch. The sixth injection was given in the outer and lateral aspect of the right thigh. This was followed by the usual reaction locally, with enlarged and painful glands in the groin. In addition the leg was so stiff and numb that she was unable to walk. There was also a profuse urticarial eruption covering both lower extremities.

Owing to the inconvenience and annoyance which the injections caused the patient they were discontinued for one week, when my colleague, Dr. Wm. B. Stanton, took charge of the case.

Seven injections were given in this second series (10-8-'04 to 10-16-'04). The first three or four were well borne, but the injections had again to be discontinued on account of the severe reactions locally. The injections were again resumed 11-4-'04, with the same result as in the two previous efforts, except that this time the rest did not make even the first injection painless. Finally, as a last resort, the serum was diluted with an equal amount of normal salt solution, but the result was the same. The serum treatment was then given up.

As before noted, the temperature had been fairly stable for some time prior to the giving of the serum. Each injection was followed by a rise in temperature to 100° or even 101° F. Within a few days after discontinuing the serum the temperature again became nearly normal, and remained so except during the menstrual periods.

The urine was examined daily from 10-4-'04 to 10-28-'04; on three occasions there was a faint trace of albumin. Otherwise nothing abnormal was noted.

The blood was examined before using the serum, and four to five hours after using it on five occasions. The increase in the number of leucocytes after the injection was constant, varying between 6000 above normal, the highest, to 1500 above normal, the lowest.

The throat presented nothing abnormal during the administration of the serum.

This case is of no value in determining the curative properties of Maragliano's serum and is of interest principally because of the untoward effects. At the beginning of the treatment, 9—21—'04, the patient's weight was one hundred and twelve pounds, a gain of twenty-four pounds since her admission; her weight 11—6—'04, when the last injection was given, was one hundred and seventeen and one-half pounds.

At the end of the year 1—1—'05, her weight was one hundred and twenty-six pounds. From this it will be seen that she gained before, during, and after the use of the serum, so that nothing can be claimed for it in that respect. The signs in the lungs showed no change either for better or worse. The attacks of diarrhea took place before, during, and after the use of the serum, the latter having no influence one way or the other.

The improvement in the temperature, pulse-rate, and respirations dated from her admission. It is hardly likely that the few injections, accompanied as they were by so much physical discomfort, contributed in any way toward the improvement in this case.

H. R. M. LANDIS.

OUR EXHIBIT AT THE UNIVERSAL EXPOSITION, ST. LOUIS.

The Institute, in the interest of education, exhibited its work at the St. Louis Exposition. The exhibit consisted of a brief history of the Institute, copies of forms and blanks used, copies of the rules given out, and samples of the utensils and material used for the prevention of tuberculosis. The forms and blanks used by the Institute, and the rules, are frequently called for by persons interested in the establishment of dispensaries in other places. For the convenience of such persons we this year print those blanks and forms which are used for the clinical and scientific work of the Institute and the rules which we distribute, as an addendum.

While the exposition was in progress we sent one of our staff, Dr. Charles J. Hatfield, who had prepared our own exhibit, to visit the tuberculosis exhibit and report on it to the staff. His report gives a good picture of the crusade against tuberculosis in this country at that time, and we publish it as an historical record.

LAWRENCE F. FLICK.

THE TUBERCULOSIS EXHIBIT AT THE LOUISIANA PURCHASE EXPOSITION.

The Louisiana Purchase Exposition in 1904 afforded an excellent opportunity to the agencies interested in the crusade against tuberculosis to make a complete exhibit of what had been accomplished in this work in the past, and thereby to point the way in which much more might be effected in the future. The Tuberculosis Exhibition in Baltimore, which antedated by a few months the opening of the fair at St. Louis, was the occasion for gathering together from the American institutions participating an exhibition nucleus which, doubtless, made easier the work of the St. Louis authorities.

An interested visitor to the World's Fair, however, could not fail to be impressed with the rather meager response to the invitation of the managers by the institutions in the fight against tuberculosis. Many of the Baltimore exhibits were there, but instead of being enlarged and developed, they appeared to be rather contracted in extent. Moreover, due to the method of arrangement, the tuberculosis exhibit proper contained only such material as was not connected with state or municipal institutions, and therefore a large part of the work done in the United States had to be looked for in other departments, where it could be found only by careful hunting. This arrangement, though perhaps rendered advisable by the necessities of the case, certainly made the teaching in tuberculosis of much less effect than it otherwise would have been, as the scattered accounts of work must have been overlooked by the majority of indifferent visitors.

An account of the more prominent features of the tuberculo-

sis exhibit may be of value as a matter of record. The exhibit proper was located in the Section on Hygiene of the Educational Building. In order to economize space and to secure a certain amount of uniformity in outline the managers had adopted a standard exhibition unit. This unit was an upright cabinet, resting upon a broader set of shelves. The cabinet contained a set of swinging frames hinged upon one side, in which placards, photographs, charts, etc., could be fastened. The set of shelves forming the base were used for storing literature for free distribution, and there was a small, glass-inclosed case on the table-top surmounting the base, in which specimens of sputum-boxes, paper napkins, etc., might be placed.

A list of exhibits is as follows:

The Pine Ridge Camp for Consumptives at Foster, Rhode Island, exhibited photographs of economical shacks, old trolley cars used as shacks, groups of patients, etc.

The Association Health Farm of the Young Men's Christian Association near Denver, Colorado, showed a model of the typical house tent of wood and canvas, now used successfully at this place, together with a series of photographs.

The Sanatorium Gabriels of Paul Smith's Station, New York, exhibited some fine photographs.

The Manhattan Hospital, East, on Ward's Island, showed a very interesting model of the tent camps now in use for the tuberculous insane. Photographs illustrating methods of treatment were also shown.

The Pennsylvania Society for the Prevention of Tuberculosis showed a frame containing specimen pamphlets used for free distribution.

The Adirondack Cottage Sanitarium offered a fine exhibit, consisting of photographs of buildings, charts showing range of temperature, rainfall, and prevailing winds, and a drawing showing the evolution of the ideal cottage for consumptive patients. The chart containing the tabulated results of treatment as shown

in patients who have been discharged from the sanitarium for periods of from one to fifteen years was most interesting to the medical profession. The laboratory also showed cultures of tubercle bacilli and preparations of pulverized bacilli and tuberculin.

The Henry Phipps Institute exhibited a series of placards containing photographs of the temporary quarters and statements of work done in the dispensary and hospital, the printed forms in use in the institution, histories, autopsies, inspector's blanks, etc., the amount of milk distributed, rules for patients, preventive measures, training school, and a map of Philadelphia showing the location of the cases treated in the first six months. In the glass case were shown the various articles given away to destitute patients, such as spit-cups, paper napkins, disinfecting materials, and milk tickets. There were also quantities of the printed rules for patients provided for free distribution.

The Muskoka Free Hospital for Consumptives, Gravenhurst, Canada, exhibited a series of charts showing results of treatment, very fine photographs, pamphlets, and preventive articles.

The Sharon Sanitarium of Sharon, Massachusetts, exhibited placards demonstrating the work, also articles of prevention, such as spit-cups, rubber pouch for paper napkins, etc.

The Boston Association for the Relief and Control of Tuberculosis exhibited placards containing reports of lectures, visits, and preventive measures.

Dr. S. A. Knopf, of New York, exhibited his publications on tuberculosis, his improved rest-chair, etc.

There was also a manufacturers' demonstration of the various forms of spit-cups of glass, nickel, porcelain, and enamel; also an exhibit of reclining chairs and rugs.

Apart from the Tuberculosis Exhibition proper, and contained in the demonstrations of work done by state and municipal boards of health, there was much valuable material. The New York City Board of Health provided a most interesting ex-

hibit of municipal regulations, which must for the present be taken as the model for American cities. There were also charts showing work done, results of registration of cases, photographs of dispensaries, and preventive literature in various languages for distribution.

The Chicago and Boston Boards of Health showed placards and photographs illustrating work done.

In the exhibit of the Massachusetts State Board of Health a most interesting demonstration was made by the State Sanatorium at Rutland. The exhibit consisted largely of photographs with explanatory notes.

The Pennsylvania State Board of Health included in its exhibit photographs of the White Haven Sanatorium of the Free Hospital for Poor Consumptives of Pennsylvania, the South Mountain Camp Sanatorium at Mont Alto, the West Mountain Sanatorium at Scranton, the Rush Hospital of Philadelphia, and the glass pavilions for consumptives at the Philadelphia General Hospital.

The State Boards of Health of Indiana, Illinois, New Jersey, Rhode Island, Florida, and Connecticut demonstrated the work which is being done for consumptives in the respective States.

The Hygiene Exhibition of the German Empire, prepared under the direction of the Imperial Board of Health in Berlin, contained a splendid demonstration of the warfare against tuberculosis in that country. The Hygiene Exhibition as a whole was remarkable in its completeness and in its excellent arrangement. In it were comprised plans and views of German-Lung-sanatoria, charts depicting proportionate deaths from tuberculosis at various ages, cultures of human and bovine tubercle bacilli, of micro-organisms similar to tubercle bacilli, microphotographs of the bacilli and of the anatomical tuberculous changes, preparations of tuberculin and tuberculol, charts showing a comparison of the successes of recovery in treatment with tuberculin and without tuberculin; there were also combustible paste-board spittoons

and paper handkerchiefs. In the sample collection of sera manufactured in Germany there were shown various preparations of the tuberculin of Koch.

In the French portion of the Section on Hygiene there were included several charts showing methods and results of work in the tuberculosis dispensaries in Paris.

It is quite possible that other exhibits of work for consumptives made by foreign countries may have been overlooked, in spite of the writer's careful search for such demonstrations.

The revised list of awards granted in this department of the Section on Hygiene of the Louisiana Purchase Exposition is supplied by Mr. John H. McGibbons, Secretary of Awards.

CHARLES J. HATFIELD.

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS

I,being the
nearest responsible relative of M.....
in consideration of treatment and care at The Henry Phipps Institute for the Study, Treatment and
Prevention of Tuberculosis, do hereby grant permission to the Medical Staff, in event of death at that
Institution, for an autopsy.

Witness, Signed,
Address, Address,

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS

Case No..... Ward No..... Bed No.....
Name
Address

DIAGNOSIS

ADMITTED

.....mo.....190

DISCHARGED

.....mo.....190

RESULT

.....M.D.

ADMISSION SLIP

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS

PHILADELPHIA

No..... Date.....190
Name.....
Admitted to Ward..... Bed No.....
By Order of Dr.....
Discharged.....190
By Order (or reason) of

PERSONAL EFFECTS.

ALL VALUABLES TO BE SENT TO THE OFFICE FOR SAFE KEEPING.

THIS SLIP TO BE RETURNED TO THE OFFICE UPON ADMISSION OF PATIENT.

DISPENSARY CARDS USED

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

MONDAY AND THURSDAY, 11 A.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

MONDAY AND THURSDAY, 2 P.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

TUESDAY AND FRIDAY, 11 A.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

TUESDAY AND FRIDAY, 2 P.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

WEDNESDAY AND SATURDAY, 11 A.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

WEDNESDAY AND SATURDAY, 2 P.M.

BRING THIS CARD

The Henry Phipps Institute

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS
288 PINE STREET

No..... Date,.....190

Name,

MONDAY, WEDNESDAY AND FRIDAY, 4.30 P.M.

BRING THIS CARD

These cards are printed on different colored papers, each card having
its own color.

EXAMINED BY { Dispensary Dr.
House Dr.

NO.

REFERRED BY

THE HENRY PHIPPS INSTITUTE

NAME SEX AGE BIRTH { Yr. Mo. Day } DISPENSARY MO. DAY, 190
HOUSE MO. DAY, 190

ADDRESS

DIAGNOSIS

NATIVITY { Personal
AncestralMarried
Single
Wid.
Separated

RACE

{ Celt
Hebrew
Teuton
Latin
Slav
Negro
Mixed
.....

ORGANS INVOLVED

PROGNOSIS { Favorable
Doubtful
UnfavorableRESULT { Disease Arrested
" Improved
" Unimproved
Death
Discontinued Treatment (1 vis. only)Successive occupations {
with time of each
How evenings were spent

Fam. Hist.	Age.	Living.	Dead.	Date.
	F.	.....	.....	.....
	M.	.....	.....	.....
	B.	.....	.....	.....
	S.	.....	.....	.....
	B.	.....	.....	.....
	S.	.....	.....	.....

If married, how long Health of consort

Tuberculosis in consort's family

Children, how many living
Ages and healthChildren, how many dead
Ages and causes of death

Miscarriages

Alcoholism in family, immediate or antecedent

Tobacco { Quantity
How long
How used

How long in present dwelling

Previous dwellings

Health of previous inmates

Private dwelling, apartment

Contagion	Pres. gen.
	Prev. "
	Suc. "
	Other association
	Occupation

Condition of health during first 5 years of life

Breast or bottle fed

Prev. dis. and when

Marasmus	Gonorrhea	Scarlatina
Typhoid	Rheumatism	Diphtheria
Malaria	Small-pox	Herpes Zoster
Fleury	Epilepsy	Mumps
Pneumonia	Measles	Chicken pox
Influenza	German Measles	Vaccination
Syphilis	Pertussis	Rickets

Duration of pres. illness { accord. to patient
accord. to hist. and exam.First symptom { accord. to patient
accord. to hist. and exam.Blood-streaked sputum { First
Hemorrhage { How many

	PAST	PRESENT
Pain		
Cough, when most severe		
Sputum { Am. Col.		
g { At night		
Dyspnea { Lying down		
{ On exertion		
Hoarseness		
Appetite		
Gastric disturb.		
Bowels, movements		
Micturition, frequency, painful		
Chills		
Sweats { Night		
{ Slight exertion or emotion		
Edema		
Catamenia { Suppressed Menopause Dysmenorrhea		
Leucorrhoea		

EXAMINATION

Height	Complexion	<div> <div>Light</div> <div>Dark</div> <div>Red</div> </div>	Difference in depression above clavicles Difference in atrophy of scapular muscles Right—left handed
Weight	<div> <div>Highest</div> <div>Ordinary</div> <div>Lowest (recent)</div> <div>Present</div> </div>	When	Glands <div> <div>Cervical</div> <div>Axillary</div> <div>Inguinal</div> <div>Other glands</div> </div>
Tongue			Disease <div> <div>Bones</div> <div>Joints</div> </div>
Palate			Abdomen <div> <div>Tenderness</div> <div>Rigidity</div> <div>Blood in stools</div> </div>
Pharynx			Other organs—
Tonsils	Color		a. Liver, palpation (outline on diagram)
Eyes	<div> <div>Pupils</div> <div>Reflexes</div> </div>		b. Spleen, palpable?
Clubbed fingers			c. Thyroid
Curved nails			d. Kidneys
General appearance			e. Appendix
Spinal curvature			Sputum analysis
			Urine analysis—React. Sp. gr. Alb. Sug. Diaz. Indican. Micro. exam.

HEART

Accentuated second sound	<div> <div>Pulmonic</div> <div>Aortic</div> </div>	Apex beat
Reduplication		Upper border
Murmurs	<div> <div>Functional</div> <div>Organic</div> </div>	Right " <div>(Also chart deep dulness.)</div>
Arteriosclerosis	<div> <div>Slight</div> <div>Moderate</div> <div>Marked</div> </div>	Cardiac rhythm
		Thrills
		Pulse <div> <div>Volume</div> <div>Tension</div> </div>

PREVENTION

Does patient sleep alone?	Is it necessary to change present dwelling?
How many members to household?	
How many sleeping rooms?	Does patient expectorate into <div> <div>1. Rags?</div> <div>2. Handkerchiefs?</div> <div>3. Elsewhere?</div> </div>
How many beds?	



FINANCIAL RESOURCES

If working, earnings per day	How many to support
If not working, how long	Rent per month
Detail family income	Insurance
Sick benefits	Do you get treatment elsewhere
	Impression of physician as to destitution

ASSISTANCE

Medicine	Spit-cups
Milk, how much per day?	Disinfectants
Eggs, how many per day?	Paper napkins

In charting on opposite page, observe following rules:—

Denote tuberculous infiltration by shading (the intensity of color representing the intensity of percussion dulness); hyperresonance by HR; Tympany by T; breath sounds by an ascending and descending line A (the length of the line showing the altered relative length of the sounds, the thickness their intensity; an interrupted line, thus  indicating cog-wheel or interrupted breath sounds); a cavity by a circle O; rales by dots; pleuritic friction rub by  other details (pneumonic dulness, empyema, etc.) in writing.

417

.....

.....

.....

.....

.....

DATE	R.	P.	T.	W.	NOTES—TREATMENT—DIET

RESUMÉ

No.

The Henry Phipps Institute

EXAMINED BY DR.

	COLOR	MO.	DAY, 190
NAME	AGE { Single Married Wid. Separ.	FIRST VISIT	MO. DAY, 190
		FOREIGN-BORN	
ADDRESS	BIRTH { Yr. Mo. Day	HIGHEST WEIGHT	
	SEX { Male Female	LOWEST WGT. BEF. FIRST VISIT	
DIAGNOSIS	PROGNOSIS { Favorable Doubtful Unfavorable	WEIGHT AT FIRST VISIT	
Organs involved		PRESENT WEIGHT	
	PROBABLE SOURCE OF CONTAGION		
	DURATION OF ILLNESS		
PREVIOUS DISEASES	RESULT (PREVIOUS YEAR)		{ Dis. Arrested Improved Unimproved
PRINCIPAL SYMPTOMS			
SPUTUM ANALYSIS	FINAL RESULT		{ Dis. Arrested Improved Unimproved Death
URINE ANALYSIS			

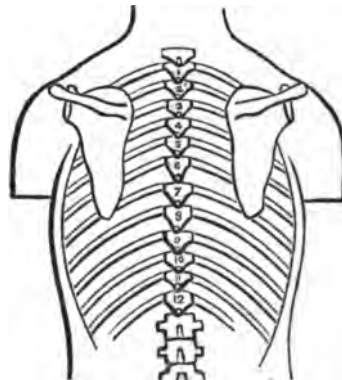
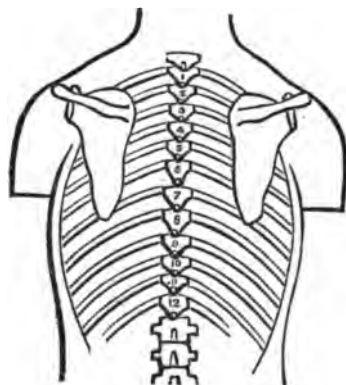
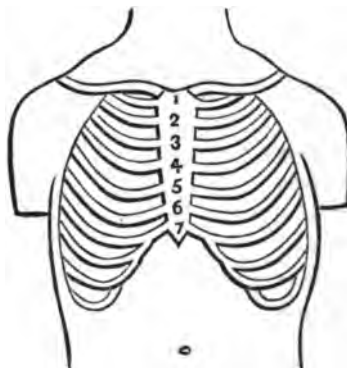
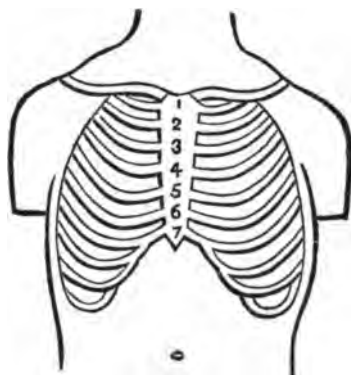
ASSISTANCE

	Previous Year	Present Year		Previous Year	Present Year
Medicine			Spit-cups		
Milk, how much per day?			Disinfectants		
Eggs, how many per day?			Paper napkins		

Re-copy first examination on this chart. Date of first examination.

Râles and breath sounds

Impairment of resonance



Heart

HENRY PHIPPS INSTITUTE.

MONTHLY SUMMARY.

Name.....

Case No.....

Date
Cough
Hæmopt
Dyspnea
Chills
N. Sweats
Strength
Sleep
Pain
Appetite
Stomach
Bowels
Menses
Exercise
Hæmoglobin
Pupils
Eye Reflexes
Deafness
Ear Discharge
Tongue
Throat
Glands
Curved Nails
Retraction of Præcordium
Accentuated Pulmonic
" Aortic
Reduplication
Murmurs
Cardiac Rhythm
Thrills
Pulse Volume
Pulse Tension

Name.....

Date.....

Ordered	Stopped	Medicine	Diet

NERVOUS EXAMINATION.

Family History { Nervous Disease
 { Insanity

Education

Disposition { In Health
 { Since Illness

Mental Attitude { Hopeful
 { Depressed
 { Suspicious

{ Since disease
 or
 in general

Sleep

Dreams { Pleasant
 { Disagreeable

Memory

Delusions

Gait

Co-ordination { Static
 { Arms

Muscular power

Right

Left

Arms { Flexion
 { Extension

Grip (dynam.)

Thighs { Flexion
 { Extension

Legs { Flexion
 { Extension

Feet { Flexion
 { Extension

Face

	Right	Left	SENSATION
Biceps Jerks			
Triceps Jerks			
Knee Jerks			
Tendo Achil. Jerks			
Plantar Reflex { Extension Flexion			
Ulnar Reflex			
Supra-orbital Reflex			
Pupils { Light Accom. Distance			
Tremor (where) { Fine Medium Coarse Irregular Intention			
SYMPATHETIC SYSTEM:			
1. Vasomotor Tone			
2. Von Graefe Sign			
3. Retraction of Eyelid			
CRANIAL NERVES:			
SENSATION:			

NOSE, THROAT AND EAR.

Prognosis of Local Condition :	Name :	
Effect on General Health :	Date :	No.
Diagnosis :	Examined by Dr.	

HISTORY :

Chief Complaint :

Nasal Respiration :

Nasal Discharge :

Pain {	Head :
	Face :
	Ears :

Nasal Subjective Symptoms :

Pharyngeal Subjective Symptoms :

Hoarseness :

Odynphagia :

Deafness :

Aphonia :

Tinnitus :

Dysphonia :

Otorrhea :

Remarks :

EXAMINATION :

Localized Tenderness :

Cervical Lymph Glands :

Nasal Vestibules :

Left Nasal Fossa :

Right Nasal Fossa :

Nasal Septum :

Tongue :

Uvula :

Teeth :

Palate :

Fauces :

Faucial Tonsils :

Posterior Pharyngeal Wall :

Lateral Pharyngeal Folds :

Pharyngeal Vault :

Pharyngeal Tonsil :

Eustachian Prominences :

Choanae :

Lingual Tonsil :

Lingual Veins :

Epiglottis :

Ary-Epiglottidean Fold { Left :
Right :

Arytenoid Cartilages { Left :
Right :

Interarytenoid Fold :

Posterior Commissure :

Ventricular Bands { Left :
Right :

Vocal Cords { Left :
Right :

Anterior Commissure :

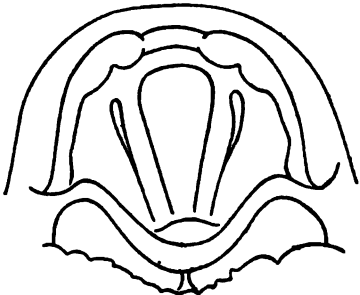
Trachea :

Ulceration { Superficial :
Deep :

Infiltration :

Congestion :

Edema :



Left Ear :

Right Ear :

DATE.	SUBSEQUENT PROTOCOL.	TREATMENT.

GENITO-URINARY AND RECTAL EXAMINATION**NAME****DATE****NO.****HISTORY****EXAMINED BY DR.****HISTORY OF G. U. OR VENEREAL DISEASES**

--	--	--

Urine { Macroscopic
Microscopic
Bacteriologic

Discharges

Secretion

Genitals

Testicle

Epididymis

Vas Deferens

Prostate

Seminal Vesicles

Lymphatics

Urethra—Endoscopy

Bladder—Cystoscopy

Ureters

Kidneys

Vulva

Vagina

Uterus

Tubes

Ovaries

Anus

Rectum

Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS

Record of Laboratory Examination.

Date,

Name,

No. History,

Physician,

Specimen,

Purpose of Examination

Result,

NOTE—This blank must be filled out legibly and sent with specimen.

INSPECTRESS' REPORT.

Date					
No.....Name					
Address					
Amount of milk received?					
Is milk used by patient?					
Is patient working?					
Does patient take cure out of doors?					
Does patient sleep with windows open?					
Does patient sit in kitchen?					
Does patient use spit cup?					
Does patient use paper napkins?					
Does patient burn spit cups and napkins?					
Does patient spit on pavement when on street?					
Does patient use handkerchiefs or rags?					
Are premises of patient clean?					
Is there a back yard and what is its condition?					
How many people are there in the house?					
Is the house an apartment house?					
How many windows in the house?					
Are any other inmates of house sick?					
Does patient use stimulants?					
Have the rules of the Institute been hung up in the house?					
Have you instructed patient in observance of rules?					
.....					
.....					
.....					
.....					
Name of Inspectress.....					

The Berry Phipps Institute

No.

FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS**AUTOPSY REPORT.**

NAME	AGE	SEX	WEIGHT	HEIGHT	NECROPSY NO.	
Admitted	190	Died		190	A.M.	P.M.
Necropsy performed	190	A.M.	P.M.	by Dr.		

CLINICAL DIAGNOSIS :

PATHOLOGICAL DIAGNOSIS :**EXTERNAL APPEARANCES :**

Post-mortem rigidity

Post-mortem lividity

Decomposition

Skin : Wounds

Scars

Jaundice

Bruises

Edema

Cyanosis

INTERNAL APPEARANCES, Preperitoneal adipose tissue

Abdominal and thoracic muscles

Position, abdominal viscera

" pelvic "

" thoracic "

Height of diaphragm—right side

left side

Special observations

THE THORAX. Sternum**Costal cartilages****Left pleura, upper lobe :** Glistening, dull, transparent, cloudy, pale, congested, thickened

Adhesions

Exudate

Left lung : Size**Weight****Color****Upper lobe****Air contents**

Hypostatic congestion

Section-surface: smooth, granular, dry, moist, dull, glistening

Color

Character of fluid exuding

Consistency: firm, tenacious, flaccid, soft, friable

Bronchi: Contents

Thickness of walls

Color of mucous membrane

Special observations, cavities, etc.

Left pleura, lower lobe: Glistening, dull, transparent, cloudy, pale, congested, thickened

Adhesions

Exudate

Left lung, lower lobe:

Air contents

Hypostatic congestion

Section-surface: smooth, granular, dry, moist, dull, glistening

Color

Character of fluid exuding

Consistency: firm, tenacious, flaccid, soft, friable

Bronchi: Contents

Thickness of walls

Color of mucous membrane

Special observations, cavities, etc.

Right pleura, upper lobe: Glistening, dull, transparent, cloudy, pale, congested, thickened

Adhesions

Exudate

Right lung: Size

Weight

Color

Upper lobe:

Air contents

Hypostatic congestion

Section-surface: smooth, granular, dry, moist, dull, glistening

Color

Character of fluid exuding

Consistency: firm, tenacious, flaccid, soft, friable

Bronchi: Contents

Thickness of walls

Color of mucous membrane

Special observations, cavities, etc.

Right pleura, middle lobe : Glistening, dull, transparent, cloudy, pale, congested, thickened

Adhesions

Exudate

Right lung, middle lobe :

Air contents

Hypostatic congestion

Section-surface : smooth, granular, dry, moist, dull, glistening

Color

Character of fluid exuding

Consistency : firm, tenacious, flaccid, soft, friable

Bronchi : Contents

Thickness of walls

Color of mucous membrane

Special observations, cavities, etc.

Right pleura, lower lobe : Glistening, dull, transparent, cloudy, pale, congested, thickened

Adhesions

Exudate

Right lung, lower lobe :

Air contents

Hypostatic congestion

Section-surface : smooth, granular, dry, moist, dull, glistening

Color

Character of fluid exuding

Consistency : firm, tenacious, flaccid, soft, friable

Bronchi : Contents

Thickness of walls

Color of mucous membrane

Special observations, cavities, etc.

Pulmonary vessels :

Larynx, Trachea

Pericardium.

Adhesions

Exudate

Heart. Contracted, dilated

Position

Shape

Weight

Size: Length

Width

Thickness

Circumference at base of ventricles

Epicardium : Glistening, dull, transparent, cloudy, pale, congested, thickened

Subepicardial adipose tissue

Special observations, size and capacity of the various chambers

Size of mitral orifice	Aortic orifice	Tricuspid orifice	Pulmonary orifice
Descriptions of the valvular lesions			

Are the valves competent ?

Thickness of left ventricle	right	Thickness of left auricle	right
Color of heart muscle		Consistency : Firm, flaccid, friable	
Endocardium elsewhere than at valves			
Coronary arteries		Coronary veins	
Aorta			
Vena Cava and other vessels			
Special observations			

Mouth and teeth

Nose and pharynx

Thyroid

Thymus

Esophagus

The Abdomen. Omentum :

Peritoneum : Glistening, dull, transparent, cloudy, pale, congested, thickened
Adhesions

Exudate

Liver. Size: Length	Breadth	Thickness	Weight
Consistency			
Surface and edges			
Section-surface: Glistening, dull, moist, dry, granular, smooth, opaque			
Color	Amount of blood		
Special observations			

Gall-bladder. Size: Length

Color

Contents

Mucous membrane and wall

Lymph glands
Special observations

Stomach.	Position	Size: Length	Breadth
Contents		Thickness of wall	
Mucous membrane			
Pylorus		Cardia	
Special observations			

Duodenum
Opening of the common bile duct

Small Intestines

Large Intestines

Appendix. Size Position
Rectum

Ischio-rectal Region

Pancreas.	Size: Length	Breadth	Thickness	Weight
Color		Consistency	Duct	
Special observations				

Right kidney.	Size: Length	Width	Thickness	Weight
Shape		Capsule		
Surface: Smooth, granular		Color	Consistency	
Section-surface: Glistening, dull, opaque		Color		
Thickness of cortex				
Pyramids: Size				
Calices				
Special observations				

Ureter

Left kidney. Size: Length	Width	Thickness	Weight
Shape	Capsule		
Surface: Smooth, granular	Color	Consistency	
Section-surface: Glistening, dull, opaque	Color		
Thickness of cortex			
Pyramids: Size			
Calices			
Special observations			

Ureter**Right adrenal.**

Shape	Consistency	
Cortex		Medulla
Special observations		

Left adrenal.

Shape	Consistency	
Cortex		Medulla
Special observations		

Bladder. Contents

Mucous membrane

Wall

Prostate. Size	Consistency
-----------------------	-------------

Seminal vesicles**Penis****Scrotum****Testicles****Vulva****Vagina**

Uterus. Size: Length	Breadth	Thickness	Shape
-----------------------------	---------	-----------	-------

Position

Section-surface

Tubes**Ovaries**

Special observations

Spleen. Size: Length	Width	Thickness	Weight
-----------------------------	-------	-----------	--------

Shape

Consistency

Capsule

Trabeculae

Section-surface: Granular, smooth

Color

Palp

Follicles

Special observations

Tonsils :

Lymphatic Glands :

Cervical Glands :

Bronchial Glands :

Mesenteric Glands :

Inguinal Glands :

Thoracic Duct :

Osseous System :

Ear

Eye

Skin and subcutaneous tissue

Muscles

Brain. Thickness of the skull

Longitudinal sinus—contents

Dura : Transparent, opaque, Thickened

Inner surface of dura : Smooth, rough, glistening, dull, opaque

Arachnoid : Transparent, opaque, dry, moist, thickened, edematous

Weight of the brain

Consistency

Cerebrum. Section-surface : Moist, dry, edematous

Puncta vasculosa

Color

Thickness of cortex

Convexity

Base

Sylvian fissure

Cerebellum**Pons****Medulla**

Special observations

Spinal Cord and membrane**Special observations**

The Henry Phipps Institute.

REPORT OF LECTURE

BY

Dr.

Date,

Place,

Subject,

Was the lecture illustrated?

If so, by what means?

Audience :

Approximate number present,

Composition (trades, etc.)

What literature was distributed?

Results,

Suggestions for future lectures,

Expense to Institute,

Application for Admission
TO THE
TRAINING SCHOOL FOR NURSES
OF
**THE HENRY PHIPPS INSTITUTE FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS.**

1. Name in full
2. Age, and date of birth
3. Height and weight
4. Social condition—single, married, widowed, or separated
5. Present and previous occupations.....
-
6. Education.....
7. P. O. Address.....

While it is the intention of this school to train as nurses young women who have had tuberculosis and are sufficiently recovered to enable them to do the necessary work, non-tuberculous applicants wishing to take up this branch of nursing are also admitted. In both instances it has been thought wise that the members of the Committee on Nursing should pass on the physical condition of each applicant.

REQUIREMENTS FOR ADMISSION
TO THE
TRAINING SCHOOL
OF
**THE HENRY PHIPPS INSTITUTE FOR THE STUDY, TREATMENT AND
PREVENTION OF TUBERCULOSIS.**

Application must be made in writing to the Superintendent of the Training School, 238 Pine Street, Philadelphia.

The blank which will then be forwarded must be filled out in the handwriting of the applicant, and if this is satisfactory the applicant will be notified to present herself for examination to the physician representing the Training School Committee.

The most suitable age is from twenty-one to thirty-three years, and it is assumed that each applicant has fully decided to continue throughout the course of two years.

If accepted, the first month is probationary, and during this time the pupil receives no remuneration. If her work is satisfactory, from the beginning of the second month to the termination of the course she will receive ten dollars monthly, together with board, lodging and washing.

The course of training will include lectures on general medical subjects, hydrotherapy, massage, cooking, bandaging and the elements of surgical nursing, and special training, both theoretic and practical, in the nursing and care of pulmonary tuberculosis.

The work of the Institute is so arranged that each nurse will be on duty only eight hours daily, while her work in the hospital will be alternated with periods during which she will act as inspectress, thus keeping her out of doors.

Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

PHYSICIAN'S DAILY REPORT.

.....day.....month 190

Number of patients seen in dispensary	Number of patients seen in hospital	Number of patients seen in their homes	NAME AND CONDITION OF PATIENTS DISCHARGED	Time spent in laboratory

Handed to.....

Entered by

Name.....

Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

DRUGGIST'S DAILY REPORT.

.....day.....month 190

Number of dispensary prescriptions put up	Number of prescriptions charged for	Number of prescriptions put up free	Number of hospital prescriptions put up	Physicians on duty	Number of patients receiving medicine	REMARKS	Amount of money taken in

Handed to.....

Entered by

Name.....

HENRY PHIPPS INSTITUTE.

Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

HEAD NURSE'S DAILY REPORT.

.....day.....month 190

Number of graduate nurses on duty	Number of pupil nurses on duty	Number of employes on duty	Number of inspectresses on duty	Number of qts. of milk served in hospital	Number of qts. of milk served in nurses' home	Number of visitors to hospital	Number of patients in hospital	Number of empty beds

Handed to.....

Entered by.....

Name.....

Henry Phipps Institute

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

CLINICAL ATTENDANT'S DAILY REPORT.

.....day.....month 190

Number of patients in dispensary	Number of qts. of milk served at depots	Number of patients on dispensary waiting list	Number of patients inspected	Number of qts. of milk served by outside milkmen	Number of tin spittoon boxes given out	Number of paper spittoon boxes given out	Number of bundles of napkins and bags given out	REMARKS

Handed to.....

Entered by.....

Name.....

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

WARD.....

[illegible]

Nurse in charge.....

RULES FOR THE PATIENTS

OF THE

HENRY PHIPPS INSTITUTE

FOR THE STUDY, TREATMENT AND PREVENTION OF TUBERCULOSIS.

1. Don't spit on the pavement, on the street, nor into any place where you cannot destroy the germs which you spit up.
2. Do not swallow any spit which comes up from your lungs or which comes out of the back part of your throat.
3. Spit into a spit cup when it is possible to do so.
4. Always use a spit cup with a handle to it so that you can hold it close to your mouth.
5. When you use a china or earthenware spit cup, always keep lye and water in it and scald out the spit cup once or twice a day with boiling water.
6. When you use a tin spit cup with a paper spit cup inside burn the paper cup at least once a day and scald the tin cup with boiling water.
7. Never use a handkerchief or a rag or any material other than paper to spit in or to wipe your mouth with.
8. When you cannot spit into a spit cup, spit into a paper napkin.
9. Always use a paper napkin to wipe your mouth with after spitting, and be careful not to soil your hands.
10. Always carry a cheap paper bag in your pocket or caba to put paper napkins in which you have used.
11. When you have used a paper napkin, either to spit in or to wipe your mouth with, fold it up carefully and put it away in a paper bag.
12. Every evening, before going to bed, burn your paper bag together with the napkins which you have deposited in it.
13. Do not let any spit get on your clothing, or your lips and hands, or your bed clothes, or carpets or furniture, or on anything about you, wherever you may be.
14. If, by any accident, any spit should be deposited anywhere else than in your spit cup or in your paper napkin, take pains at once to destroy it, either by taking it up and putting it in the fire or by putting lye and water on it.
15. If you have a moustache or beard shave it off or crop it close.
16. Always wash your lips and hands before eating or drinking, and rinse out your mouth.
17. If you have a running sore take up the matter which is given off with absorbent cotton and burn it.
18. Avoid handshaking and kissing. These customs are dangerous to you as well as to others. They may give *others* consumption; they may bring *you* colds and influenzas which will greatly aggravate your disease and may prevent your recovery.
19. Do not cough if you can help it. You can control your cough to a great extent by will power. When you cough severely hold a paper napkin to your mouth so as not to throw out spit while coughing.
20. Sit out of doors all you can. If you have no other place to sit than the pavement sit on the pavement in front of your house.
21. Don't take any exercise except upon the advice of your doctor.
22. Always sleep with your windows open, no difference what the weather may be.
23. Avoid fatigue. One single fatigue may change the course of your disease from a favorable one to an unfavorable one.
24. Go to bed early. If you are working, lie down when you have a few moments to spare.
25. Don't take any medicine unless it has been prescribed by your physician. Medicine may do harm as well as good.
26. Don't use alcoholic stimulants of any kind.
27. Don't eat pastry or dainties. They do not nourish you and they may upset your stomach.
28. Take your milk and raw eggs whether you feel like it or not.
29. Keep up your courage. Make a brave fight for your life. Do what you are told to do as though your recovery depended upon the carrying out of every little detail.
30. Always keep in mind that consumption can be cured in many cases and that it can be prevented in all cases.
31. If your own disease is too far advanced for you to recover, console yourself with the idea that you can keep those who are near and dear to you from getting it.

SPECIAL INDEX OF CASES MENTIONED IN THE REPORT.

CASE No.	WEIGHTS OF ORGANS, 52 TO 54.	AIR PASSAGES, 88 TO 89.	NERVOUS SYSTEM, 95 TO 135.	KIDNEYS, 171 TO 233.	HEART, 248 TO 249.	LIVER, 263 TO 269.	PNEUMOTHORAX, 292.	SERUM, 382-389, 392-403.
53	..	..	..	171	..	..	..	..
142	52	..	..	221	..	..	..	..
172	52	..	..	222	..	..	..	..
232	52	..	..	172	..	264, 265, 276	..	..
236	52	..	..	172	..	264-266, 277	..	..
282	52	..	..	174	..	264, 265, 271	292	..
313	52	..	..	222	..	..	..	..
388	..	..	..	..	..	..	..	383, 384, 389
414	..	..	..	223	..	..	..	..
433	..	..	..	..	..	..	292	..
462	52	..	..	..	..	..	..	..
501	52	..	..	175	..	264-266, 273	..	..
551	52	..	..	175	..	264, 265, 286	..	..
560	52	..	..	..	..	..	..	..
714	52	..	..	176	..	264-266, 276	292	..
734	52	..	..	..	..	..	..	..
795	52	..	..	..	..	..	..	..
880	..	..	..	..	..	..	292	..
945	52	..	..	177	249	..	..	..
1032	52	..	..	178	..	264-266, 274	..	..
1033	..	..	..	..	..	..	292	..
1157	52	..	..	224	249	264-266	..	..
1160	..	..	..	..	..	..	292	..
1170	52	..	..	..	..	..	..	..
1278	..	..	..	..	..	..	292	..
1279	52	..	..	179	..	..	..	..
1334	52	..	..	..	..	..	..	..
1344	52	..	..	224	248	..	..	..
1402	52	..	..	225	..	..	..	..
1411	52	..	..	..	..	..	..	..
1433	52	..	..	226	..	..	..	..
1490	52	..	..	226	..	..	..	..
1568	52	..	..	..	249	..	..	..
1577	52	..	131	179	..	263-266, 268	..	..
1621	..	..	..	227	..	..	..	..
1659	52	..	..	..	..	..	..	..
1694	..	..	..	..	..	..	..	382, 384, 385, 387-389
1742	..	..	130	..	..	..	..	..
1756	52	..	..	228	..	..	..	..

Figures refer to page upon which detailed report is given.

CASE No.	WEIGHTS OF ORGANS, 52 TO 54.	AIR PASSAGES, 88 TO 89.	NERVOUS SYSTEM, 95 TO 135.	KIDNEYS, 171 TO 233.	HEART, 248 TO 249.	LIVER, 263 TO 269.	PNEUMOTHORAX, 292.	SERUM, 382-389, 392-403.
1859	52	..	..	..	..	..	..	..
1896	53	..	..	180	..	..	..	..
1931	..	..	131	..	..	..	..	..
1950	..	..	..	..	..	..	..	401-403
1975	..	..	..	..	..	..	..	383, 384, 386-389
1988	53	..	..	228	..	..	..	..
1994	53	..	132	..	..	..	..	..
1998	53	..	..	229	..	..	..	..
2041	..	..	131	..	..	..	..	..
2046	53	..	..	181	..	264, 265, 267	..	..
2099	..	89	..	..	..	..	..	..
2102	53	..	..	182	249	264-266, 272	..	..
2104	53	..	..	230	248	..	..	..
2119	53	..	..	..	..	..	..	..
2138	53	..	..	230	..	..	..	..
2139	..	..	132	..	..	..	..	..
2149	53	..	130	..	..	..	..	..
2175	..	..	135	..	..	..	..	..
2180	53	..	..	183	..	263-266, 280	..	..
2181	53	..	130	230	..	..	..	..
2205	..	89	..	..	..	..	..	..
2213	53	..	..	184	248	..	..	..
2226	53	..	..	..	..	..	..	..
2238	53	..	..	231	..	..	292	..
2244	53	..	..	..	..	..	..	..
2252	53	..	..	184	..	263-265, 267	..	..
2262	53	..	..	185	..	..	..	..
2271	53	..	130	..	..	..	..	..
2289	53	..	..	186	249	..	292	..
2295	53	..	131	..	248	..	..	..
2311	53	..	..	232	..	..	..	..
2324	53	..	..	233	..	..	..	..
2344	53	..	..	187	..	..	..	..
2347	53	..	104-106	188	..	..	..	..
2356	53	..	131	189	..	264-266, 269	..	..
2360	53	..	..	190	..	..	..	..
2388	..	..	..	..	..	..	..	383, 384, 389
2416	53	..	..	191	248	..	..	..
2444	53	..	..	192	..	..	..	..
2446	53	..	..	192	..	263-265, 279	..	..
2468	53	..	..	193	248	..	..	..
2477	53	..	131	194	249	..	..	..
2490	54	..	..	195	..	..	..	..
2494	54	..	..	196	..	264-266, 281	..	..
2538	54	89	..	197	..	264-266, 274	..	..
2553	54	..	..	197	..	..	..	..
2564	54	..	131	198	248	264, 265, 269	..	..

Figures refer to page upon which detailed report is given.

SPECIAL INDEX OF CASES MENTIONED IN REPORT. 447

CASE No.	WEIGHTS OF ORGANS, 52 TO 54.	AIR, PASSAGES, 88 TO 89.	NERVOUS SYSTEM, 95 TO 135.	KIDNEYS, 171 TO 233.	HEART, 248 TO 249.	LIVER, 263 TO 269.	PNEUMOTHORAX, 292.	SERUM, 382-389, 392-403.
2576	54	..	..	199	..	264, 265, 272	..	..
2582	54	..	..	200	248	263-266, 270	..	..
2596	54	..	130	201	..	264-266, 282	..	..
2602	54	..	..	202	..	264, 265, 279	..	..
2608	..	..	..	..	..	..	..	392-396, 399
2632	..	..	..	..	..	..	..	392-396, 399
2657	54	..	..	202	249	264, 265, 275	..	..
2662	54	..	..	203	..	263-266, 277	..	..
2664	54	..	..	204	249	..	..	..
2668	54	88	..	205	248	264, 265, 271	..	..
2674	..	..	..	..	..	..	..	392-395, 397,
								399
2676	..	..	102-104, 131	..	..	..	..	392-395, 397,
								399
2689	54	..	..	206	..	264-266, 273	..	..
2691	..	..	..	..	..	..	..	392-395, 397,
								399
2701	54	..	..	206	..	263-265, 278	..	..
2716	54	..	..	207	..	264-266, 285	..	..
2727	..	..	..	..	..	..	..	392-395, 398,
								399
2737	..	..	..	..	..	..	..	392-395, 398,
								399
2760	..	..	..	..	..	..	..	392-395, 399,
								400
2768	54	..	131	208	..	..	..	..
2787	54	..	..	209	..	264, 265, 283	..	..
2796	..	..	131	209	..	264-266, 284	..	..
2799	..	..	..	..	..	..	..	383, 384, 389
2800	54	..	131	210	..	..	..	..
2813	..	..	..	..	..	..	..	392-395, 399,
								400
2815	54	..	..	211	..	264, 265, 281	..	..
2821	54	..	..	212	..	264, 265, 284	..	..
2842	..	88	..	..	..	..	..	..
2855	54	..	..	212	249	264, 265, 287	292	..
2856	54	..	..	213	..	264, 265, 286	..	..
2899	54	..	..	214	..	264-266, 283	..	..
2926	54	..	..	215	..	264, 265, 287	..	..
2957	..	..	120-124	..	..	..	..	..
2977	..	..	..	216	..	..	..	..
2989	54	..	..	217	249	..	..	..
3010	54	..	130	218	..	264-266, 288	..	..
3054	..	..	..	219	..	..	..	..
3142	..	..	106, 107, 131	..	..	..	..	..
3388	..	..	107, 108	219	..	..	..	..
3440	..	..	95-99	..	..	..	..	..

Figures refer to pages upon which detailed report is given.

INDEX.

- ACCENTUATION** of pulmonic second sound, 240
Admissions, 4
Affections of spine, 114
Age and sex, influence of, in nephritis, 165
 of patients, 11
Aid given patients, 42
Alcoholism in patients, 23
Alimentary canal, disturbances of, 31
Amyloid degeneration of kidney, 165
 of liver, 259
Animals, immunization of, against tuberculosis, 311
Appearance of patients, general, 16
Appendix at autopsy, 76
Arteriosclerosis in tuberculosis, 241
Arthritis, rheumatoid, 115
 tuberculous, 114
Atrophy of scapular muscles, 38
Autopsies, 50-86
 appendix, 76
 bedsores, 57
 bladder, 83
 blood-vessels, 62
 emaciation, 55
 esophagus, 73
 Fallopian tubes, 85
 fat, subcutaneous, 55
 heart, 59
 intestine, large, 77
 small, 75
 ischio-rectal region, 78
 kidneys, 80
 liver, 72
 lungs, 67
 lymphatic glands, 78
 omentum, 74
 ovaries, 85
 pancreas, 79
 pericardium, 57
 peritoneum, 73
 pleura, 62
 prostate, 84
 spleen, 70
 stomach, 74
 suprarenal glands, 82
 testicles, 84
 thyroid gland, 85
 ureters, 85
 uterus, 84
 weights of organs, etc., 55
BABINSKI reflex, 134
Bedsores at autopsy, 57
Benefits, sick, of patients, 21
Bladder at autopsy, 83
Blanks, forms, and rules, 411-444
Blood-vessels at autopsy, 62, 237
Brain, pseudo-gelatinous exudate, in ventricles of, 109
Buildings, 3
CARDIAC conditions in tuberculous cases, 236
 weakness, treatment of, 250
Casts in urine, 164
Cellular accumulations in kidneys, 152, 157, 234
Change in residence, 10
Changes in intra-muscular adipose tissue, 128
Choroid plexus, tuberculosis of, 108
Circulatory system, 34
Cirrhosis of liver in tuberculosis, 260
Clinical findings in heart, 239
 recognition of tuberculosis of liver, 252, 263
 reports on use of Maragliano serum, 382-403
 symptoms of nephritis in tuberculosis, 160, 234
Color of patients, 13
Condition, social, of patients, 13
Congestion of liver in tuberculosis, 260, 265
Contagion, source of, in patients, 27
Cough, freedom from, 39
Cysts of kidney, 160
DEGENERATION of muscle fibers, 127
 of ganglion cells, 116
Delusions in tuberculosis, 145
Dependents on patients, 21
Dermatological report, 147-150
Diarrhea in nephritis, 162-234
Digestive disturbances, 31
Disease, duration of, 41
 in nephritis, 168
 non-tuberculous, in upper air-passages, 88
 previous, in patients, 24
 tuberculous, of upper air-passages, 88

Dispensary, milk, 4
Dyspnea in nephritis, 168, 234

EARNING capacity of patients, 20
Edema, 38
 in nephritis, 162, 234
Emaciation, 55
Emigrants, 8
Encephalitis, chronic, 101
Ependymal changes, 109-113
Ependymitis, hemorrhagic, 111
Esophagus at autopsy, 13
Exhibit at St. Louis Exposition, 404
Exophthalmic goiter, 135
Experiments in immunization of animals
 311-381
Eyes of patients, 14

FALLOPIAN tubes at autopsy, 85
Fat, subcutaneous, at autopsy, 55
Fatty change in liver, 259
Fibrous areas in kidneys, 152, 157, 234
Forms, blanks, and rules, 411-444
Functional nervous disturbances, 129

GANGLION cell degeneration, 116
General appearance of patients, 16
Glands, lymphatic, at autopsy, 78
 suprarenal, at autopsy, 82
 thyroid, at autopsy, 86

HANDS, tremor of, 134
Healed tubercles in kidneys, 156
Heart (see *Circulatory system*), 34
 at autopsy, 59, 237
 clinical findings, 239
 condition of, in nephritis, 166, 167, 234
 disease, valvular, 245
 hypertrophy of, 243
Height of patients, 14
Hemoptysis, 37
Hemorrhagic ependymitis, 111, 113
Histologic changes in liver, 266
Hoarseness, 36
Home, nurses', 3
Homes of patients, sickness in, 22
Housing of patients, 9
Hydrocephalus, 113
Hypertrophy of heart in tuberculosis, 243

ILLUSTRATIONS:
 anterior horn cells, spinal cord, 114

Illustrations, areas of hemorrhagic meningo-
 encephalitis, 102
 caseating tubercles of choroid plexus,
 150
 healed tubercle in center of pyramid
 170
 Malpighian body, tubercle in, 150
 meningitis, tuberculous, 106
 muscles, sections of, 114
Immunization in tuberculosis, 294
 of animals against tuberculosis, 311
Infarcts in kidneys, 160
Insane states, 130
Intestines, large, at autopsy, 77
 small, at autopsy, 75
Intramascular adipose tissue, changes in,
 128
Involvement of tissues, 28
Ischiorectal region at autopsy, 78

KIDNEYS at autopsy, 80-82
 in tuberculosis, 151-234
 cellular accumulations in, 152,
 157, 234
 cysts in, 160
 fibrous areas in, 152, 157, 234
 healed tubercles in, 156
 infarcts in, 160
 macroscopic appearance of, 154
 surgical, 155
 tubercles in, 151, 155, 233

LABORATORY, 3
Landry's paralysis, 119
 report of case, 120-124
Laryngological report, 87-92
Leptomeningitis, acute, 94
 chronic, 100
 subacute, 99
Liver at autopsy, 72
 amyloid degeneration of, 259
 cirrhosis of, 260
 congestion of, 260, 265
 fatty changes in, 259
 histologic changes in, 266
 in tuberculosis, 251-289
 report of cases, 266-289
 microscopic findings in enlarged, 265
 tubercles in, 264
 location of, 264
 tuberculosis of, 251
 clinical recognition, 252, 263
 mode of infection, 255
 varieties of, 257
Lungs at autopsy, 67-70
 site of origin of tuberculosis in, 28
Lupus vulgaris, 147
Lymphatic glands at autopsy, 78

- MACROSCOPIC** appearance of kidneys in tuberculosis, 154
Malpighian bodies, 156, 157
Maragliano serum, 296-310
 clinical reports on use of, 382-403
Marmorek serum, 307
Measurements of patients, 15
Meninges of spinal cord, 114, 115
Meningitis, 94-108
 acute leptomeningitis, 94
 chronic leptomeningitis, 100
 subacute leptomeningitis, 99
 tuberculous leptomeningitis, 95
Mental attitude in tuberculosis, 129, 137-146
 effect of education upon, 140
 effect of heredity upon, 141
Milk station, 4
Mode of infection in tuberculosis of liver, 255
Muscles, scapular, atrophy of, 38
Muscular system, 125-129
 changes in intramuscular adipose tissue, 128
 granular fatty degeneration of muscle fibers, 127
- NATIVITY** of patients, 6
Nephritis in tuberculosis, 153-234
 clinical symptoms of, 160, 234
 diarrhea in, 162, 234
 dyspnea in, 168, 234
 edema in, 162, 234
 heart condition in, 166, 167, 234
 pulse in, 167
 relation of occupation to, 169
 report of cases, 171-233
 respiratory rate in, 168
Nervous system, 93-136
 affections of spine, 114
 ependymal changes, 109-113
 functional disturbance of, 129
 ganglion-cell degeneration, 115
 hydrocephalus, 113
 Landry's paralysis, 119
 meningitis, 94-108
 paralysis due to tuberculosis, 117, 118
 spinal cord and its meninges, 114-125
 sympathetic system, 135
 disturbance of, 32-34
 tuberculous neuritis, 125
Neuritis, tuberculous, 125
Night-sweats, 37
Nurses' home, 3
 training school, 3
- OBSERVANCE** of rules, 43
Occupation of patients, 17-20
- Occupation**, relation of, to nephritis, 169
Omentum at autopsy, 74
Organs, weights of, 52-54
Origin, site of, in tuberculosis of lungs, 28
Ovaries at autopsy, 85
- PAIN**, 36
Pancreas at autopsy, 79
Paralysis due to tuberculosis, 117, 118
Pathogenesis of nephritis, 170
Patients, age of, 11, 12
 alcoholism in, 23
 appearance of, general, 16
 color of, 13, 14
 contagion in, source of, 27, 28
 dependents on, 21, 22
 digestive disturbance in, 30-32
 dispensary, 5
 earning capacity of, 20, 21
 eyes of, 14, 15
 height of, 15, 16
 hospital, 5
 housing of, 9, 10
 larynx of, 89
 nativity of, 6
 new, 4, 5
 occupation of, 17-20
 old, 4, 5
 previous diseases in, 24
 tuberculosis in, 25
 residence of, 8
 return of, 48
 sex of, 12, 13
 sick benefits of, 21
 sickness in homes of, 22
 social conditions of, 13
 streets lived on, character of, 9
 throat condition of, 25, 26
 tissues involved, 29, 30
Pericardium at autopsy, 57, 58, 237
Peritoneum at autopsy, 73
Pleura at autopsy, 62-67
Pneumothorax in tuberculosis, 290-293
Prostate at autopsy, 84
Pseudo-gelatinous exudate in ventricles of brain, 109
Pseudo-paresis, tuberculous, 132
Pulmonic second sound, accentuation of, 240
 reduplication of, 240
Pulse in nephritis, 167
Pulse-rate, relation of, to progress of disease, 244
- REDUPLICATION** of pulmonic second sound, 240

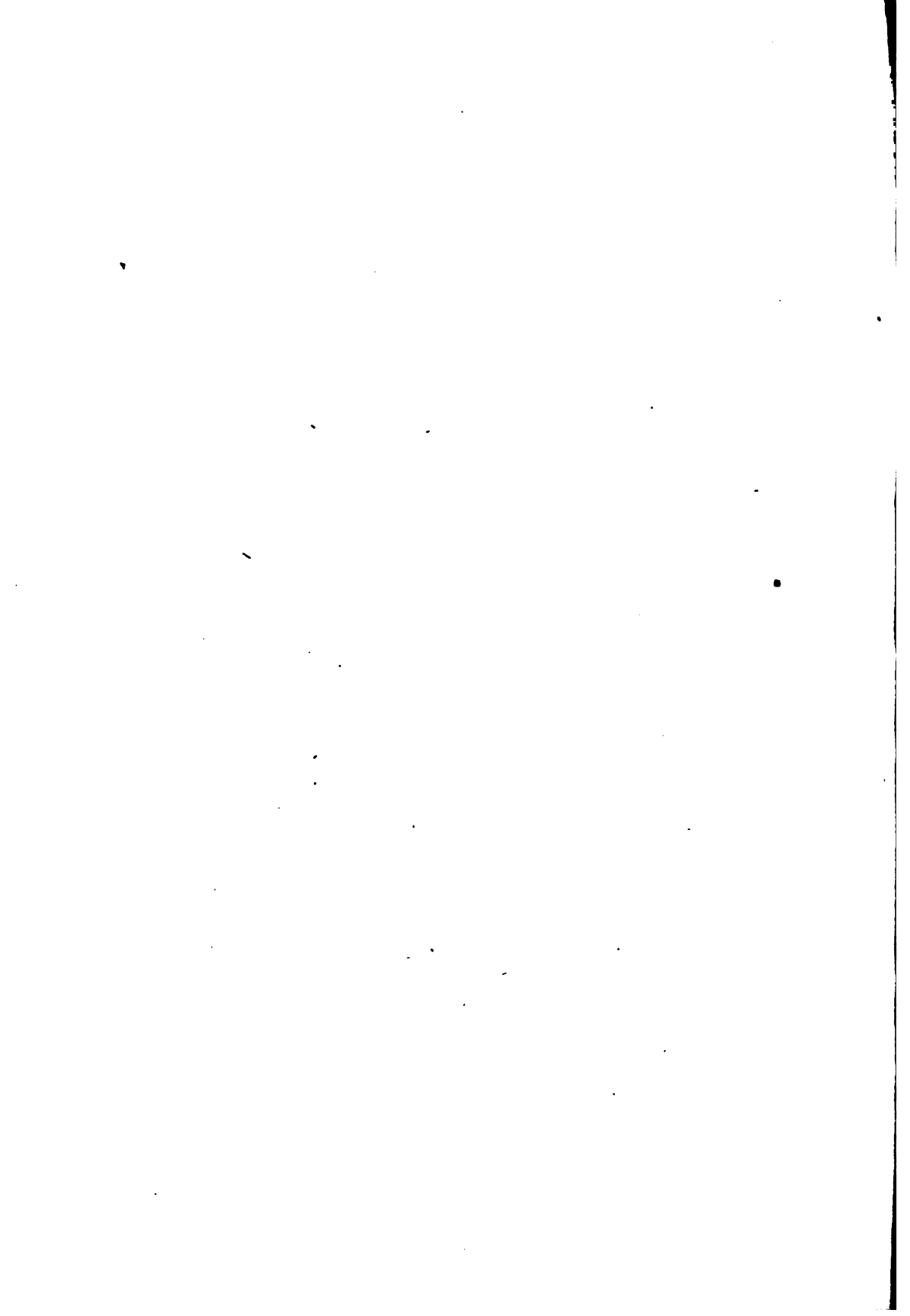
Reflex, Babinski, 134
 Reflexes in tuberculosis, 134
 Relation of occupation to nephritis, 169
 of pulse-rate to progress of disease, 244
 Renal tubules in tuberculosis, 159
 Report, autopsy, 50
 laryngological, 87-92
 on Maragliano serum, 296-310
 Reports, clinical, on use of Maragliano serum, 382-403
 Residence of patients, 8
 change of, 10, 11
 Respiratory rate in nephritis, 168
 Results of treatment, 46, 47
 Return of patients, 48
 Review on immunization of animals against tuberculosis, 311-381
 Rheumatoid arthritis associated with tuberculosis, 115
 Rules, observance of, 43
 forms, and blanks, 411-444

SCAPULAR muscles, atrophy of, 38
 School, nurses' training, 3
 Serum, Maragliano, clinical reports on, 382-403
 method of producing, 296-310
 Marmorek's, 307
 -therapy, history of, 296
 Sex, influence of age and, on nephritis, 165
 of patients, 12, 13
 Sick benefits of patients, 21
 Sickness in homes of patients, 22
 Skin, tuberculous ulceration of the, 147
 Social condition of patients, 13
 Source of contagion in patients, 27, 28
 Spinal cord in tuberculosis, 114, 115
 meninges of, 114, 115
 Spine, affections of, 114
 Spleen at autopsy, 70, 71
 Sputum, tubercle bacilli in, 40
 Station, milk, 4
 Stomach at autopsy, 74
 Streets lived on by patients, character of, 9
 Subacute leptomeningitis, 99
 Suprarenal at autopsy, 82
 Surgical kidney, 155
 Sympathetic nervous system, 135
 disturbance of, 32-34
 Symptoms of exophthalmic goiter in tuberculosis, 135
 System, circulatory, diseases of, 34, 135
 Sweats, night-, 37

TABLES, age of patients, 11
 aid given patients, 42
 alcoholism in patients, 23

Tables, appearance, general, of patients, 16
 appendix at autopsy, 76
 atrophy of scapular muscles, 38
 bedsores at autopsy, 57
 bladder at autopsy, 83
 blood-vessels at autopsy, 62
 cases treated with Maragliano serum, 389, 395, 399
 of pneumothorax, 292
 change of residence, 10
 character of streets, 9
 color, 13
 condition, social, 13
 condition of throat, 25
 dependents, 21
 diseases of circulatory system, 34
 previous, 25
 tuberculous, previous, 25
 disturbance of alimentary canal, 31
 of sympathetic nervous system, 32
 duration of disease, 41
 earning capacity of patients, 20
 edema, 38
 emaciation at autopsy, 55
 eyes, 14
 Fallopian tubes at autopsy, 85
 fat, subcutaneous, at autopsy, 55
 freedom from cough, 39
 heart at autopsy, 59
 height, 15
 hemoptysis, 37
 hoarseness, 36
 housing of patients, 9
 intestines, large, at autopsy, 77
 small, at autopsy, 75
 ischio-rectal region at autopsy, 78
 kidneys at autopsy, 80-82
 laryngological work, 87-92
 liver at autopsy, 72
 lungs at autopsy, 67-70
 lymphatic glands at autopsy, 78
 mixed parentage, 7
 nativity, 6
 night-sweats, 37
 non-tuberculous diseases of upper air-tract in non-tuberculous cases, 88
 of upper air-tract in tuberculous cases, 88
 observance of rules by patients, 43
 occupation, 17-18
 omentum at autopsy, 74
 ovaries at autopsy, 85
 pain, 36
 pancreas at autopsy, 79
 pericardium at autopsy, 57
 peritoneum at autopsy, 73
 place of beginning in tuberculosis of lungs, 28

- Tables, pleura at autopsy, 62-67
 pneumothorax cases, 292
 previous diseases in patients, 24
 tuberculous diseases in patients, 25
 prostate at autopsy, 84
 results of treatment, 46
 return patients, 48
 sex, 12
 sick benefits, 21
 sickness at home of patients, 22
 social condition, 13
 source of contagion, 27
 spleen at autopsy, 70, 71
 stomach at autopsy, 74
 suprarenal gland at autopsy, 82
 testicles at autopsy, 84
 thyroid gland at autopsy, 86
 tissue involved, 29
 tubercle bacilli in sputum, 40
 ureters at autopsy, 84
 urinary abnormalities, 35
 uterus at autopsy, 85
 work, 19
 weight, 44
 Tachycardia in tuberculosis, 247
 Treatment of heart weakness in tuberculosis, 250
 Tremor in tuberculosis, 134
 Tubercle bacilli in urine, 151, 165, 234
 Tubercles around Malpighian bodies, 156
 in kidneys, 151, 155, 233
 in liver, 264
 location of, 264
 Tuberculosis, amyloid degeneration of liver in, 259
 arterio-sclerosis in, 241
 blood-vessels in, pathological findings, 237
 cirrhosis of liver, 260
 clinical findings in heart in, 239
 symptoms of nephritis in, 160, 234
 congestion of liver in, 260, 265
 delusions in, 145
 fatty change in liver in, 239
 functional disturbances of nervous system in, 129
 heart in, pathological findings, 237
 hypertrophy of heart in, 243
 immunization in, 294, 295
 insane states in, 130
 kidneys in, 151-234
 report of cases, 171-234
 liver in, 251-289
 report of cases, 266-289
 Malpighian bodies in, 157
 Tuberculosis, mental attitude in, 129, 137-146
 nephritis in, 153, 234
 report of cases, 171-233
 nervous system in, 93-136
 of choroid plexus, 108
 of liver, 251
 clinical recognition, 252, 263
 mode of infection, 255
 varieties, 257
 of the skin, 147
 paralysis due to, 117-118
 pericardium in, pathological findings, 237
 pneumothorax in, 290-293
 reflexes in, 134
 renal tubules in, 159
 skin in, 147-150
 sympathetic system in, 135
 symptoms of exophthalmic goiter in, 135
 tachycardia in, 247
 tremor in, 134
 urine in, 163, 234
 valvular heart disease in, 245
 vis sexualis in, 146
 Tuberculous arthritis, 114
 cases, cardiac conditions in, 236
 meningitis, 95
 meningo-encephalitis, chronic, 101
 neuritis, 125
 pseudo-paresis, 132
 ulceration of skin, 147
 ULCERATION of skin, tuberculous, 147
 Ureters at autopsy, 84
 Urine, abnormalities of, 35
 albumen in, 164, 234
 casts in, 164, 234
 in tuberculosis, 163, 234
 tubercle bacilli in, 151, 165, 234
 Uterus at autopsy, 85
 VALVULAR heart disease in tuberculosis, 245
 Varieties of tuberculosis of liver, 257
 Venous stasis, relation of, to formation of pseudo-gelatinous exudate, 109
 Ventricles of brain, pseudo-gelatinous exudate in, 109
 Vis sexualis in tuberculosis, 146
 WEIGHT of organs, 52-54
 of patients, 44-46



**This book should be returned to
the Library on or before the last date
stamped below.**

**A fine of five cents a day is incurred
by retaining it beyond the specified
time.**

Please return promptly.